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Other brand or product names are the trademarks or registered trademarks of their respective holders.  For additional information, please contact us at [oem.sales@monotypeimaging.com](mailto:oem.sales@monotypeimaging.com).  Printed in the United States of America Printed: February 14, 1997    **Index**    [1.0 Introduction](http://monotype.de/services/pan1) | [2.0 Latin Text and Display](http://monotype.de/services/pan2) | [3.0 Latin Hand Written](http://monotype.de/services/pan3) [4.0 Latin Decorative](http://monotype.de/services/pan4) | [5.0 Latin Pictoral](http://monotype.de/services/pan5) | [6.0 Summary of Variables](http://monotype.de/services/pan6) [7.0 Calculated Variables](http://monotype.de/services/pan6/#Sec7CalculatedVariables) | [8.0 PANOSE Submission Form](http://monotype.de/services/pan6/#Sec8PANOSESubmissionForm) [9.0 PANOSE Classification Sheet](http://monotype.de/services/pan6/#Sec9PANOSEClassificationSheet)    **1.0 Introduction**    **1.1 PANOSE Classification**  **1.1.1 Metrics Guide**  The PANOSE Typeface Matching System was developed by Benjamin Bauermeister and is exclusively licensed to Hewlett-Packard Corporation in Seattle, Washington. Under copyright this document is being provided to third party vendors of typeface products and type related utilities to aid in understanding the details of the PANOSE Typeface Matching System and to describe the process of assigning PANOSE Classification Numbers to typefaces.  Hewlett-Packard does not restrict the use of PANOSE Classification Numbers in typeface products developed by third parties. Hewlett-Packard does however strongly urge you to submit written notice and samples of typefaces developed with the PANOSE Typeface Matching System to Hewlett-Packard Corporation. Submission forms are available in [Section 8](http://monotype.de/services/pan6/#Sec8PANOSESubmissionForm) of this document This provides Hewlett-Packard with the information necessary to enhance, expand, and solidify the PANOSE Typeface Matching System as it is applied to an increasing variety of font designs. We welcome your feedback.  In addition Hewlett-Packard reserves the use of the PANOSE trademark exclusively for typefaces that have been officially verified and registered with Hewlett-Packard. PANOSE licensing information can be obtained by [contacting us](http://monotype.de/about/contact-us). Typeface classification and verification services are also available from Hewlett-Packard. Fonts classified by Hewlett-Packard are allowed full use of the PANOSE trademark. Sample classification submission forms are found in [Section 9](http://monotype.de/services/pan6/#Sec9PANOSEClassificationSheet) of this document. Separate licensing is available for use of the mapping algorithms for cross platform and web font solutions.  **1.1.2 Overview**  This document provides a detailed record of the process required to classify a Latin text, display, handwritten, or decorative face or symbolic fonts with the PANOSE Typeface Matching System. Great care has gone into making this document as complete as possible in order to avoid any conflicts or confusion that may arise in the classification of typefaces. However, with the varied world of type design, this document is subject to change as more data regarding lesser known faces become available. Please feel free to send your additions or clarifications to by [contacting us](http://monotype.de/about/contact-us)  The process of determining a PANOSE Classification Number starts with a series of measurements. While the total number of measurements is nearing sixty-five for a text font, far fewer are required to classify most typeface designs. Still, until the classification parameters are familiar, diligence should win out over expediency in the pursuit of creating PANOSE Classification Numbers that are consistent and correct.  Ratios are computed using the measured values. The classification criteria for PANOSE is based on these inter-related ratios. Because of this, PANOSE measurements can be taken on samples of type at any size, as long as the measurement system is not changed during the classification process of a given face.  The rules for proper measurement, laid out below, are being refined so that minimal human intervention will be required to classify a typeface. At this time, however, there are no approved tools for the automation of PANOSE Classification Number assignment. This document tries to provide detailed descriptions about the mechanics of measuring every attribute, while presenting methods to quickly glean the same information using visual feedback only.  PANOSE is a classification system for visual attributes of type only. There is no information contained within a PANOSE Classification Number that pertains to the character widths, spacing metrics, or advance widths. This simplifies the process of classification because we only describe attributes that can be seen and measured.  **Figure 1 - PANOSE Universe**  Panose font example  PANOSE Classification Numbers used in static outline fonts consist of ten digits. The first digit defines what type of font is being classified (Latin Text, Symbolic, Japanese Decorative, etc.) (Figure 1) and the following 9 provide classification within that type. Thus digits 2 through 10 change meaning depending on what the first digit is. There is always a digit that expresses weight, one that expresses aspect ratio, and a monospace / proportional flag but their position may change depending on the type of font. The order of the digits is roughly the order in which they are useful in maximizing the separation of closely related faces. Thus the position of digits expressing the same quantity (for example aspect ratio) will not always be the same (it is digit 4 in Latin Text and 5 in Latin Handwritten). Below is a summary of all the digits in all the presently defined font types:  [**Latin Text**](http://monotype.de/services/pan2)**:** 1. Family Kind (= 2 for Latin Text) 2. Serif Style 3. Weight 4. Proportion 5. Contrast 6. Stroke Variation 7. Arm Style 8. Letterform 9. Midline 10. X-height  [**Latin Hand Written**](http://monotype.de/services/pan3)**:** 1. Family Kind (= 3 for Latin Hand Written) 2. Tool Kind 3. Weight 4. Spacing 5. Aspect Ratio 6. Contrast 7. Topology 8. Form 9. Finials 10. X-ascent  [**Latin Decoratives**](http://monotype.de/services/pan4)**:** 1. Family Kind (= 4 for Latin Decorative) 2. Class 3. Weight 4. Aspect 5. Contrast 6. Serif Variant 7. Treatment 8. Lining 9. Topology 10. Range of Characters  [**Latin Symbol**](http://monotype.de/services/pan5)**:** 1. Family Kind (= 5 for Latin Symbol) 2. Kind 3. Weight 4. Spacing 5. Aspect Ratio & Contrast 6. Aspect Ratio of Character 94 7. Aspect Ratio of Character 119 8. Aspect Ratio of Character 157 9. Aspect Ratio of Character 163 10. Aspect Ratio of Character 211  PANOSE uses an expanded form for other applications such as distortable type. Contact Hewlett-Packard Corporation for more information about the expanded form of PANOSE.  While measuring typefaces for the PANOSE Typeface Measuring System is generally straightforward, be aware of the following special considerations when classifying a typeface to assign a PANOSE Classification Number:  **1.1.3 Italic Character Forms**  This version of the PANOSE Classification Metrics Guide not only contains specific weight settings for fonts, but also contains classification parameters to isolated italic fonts based on their character skew. There are several measurements in this classification document that require special treatment if an italic font is being classified. Sometimes the horizontal distance between two points is required and the two points are not on the same horizontal plane. A simple measurement of the horizontal distance between these points is not going to yield accurate results. Compensating for the character skew when the measurement is taken will result in proper compliance with the PANOSE Typeface Matching System scheme. Whenever possible, the special cases of compensation for italic fonts have been noted in this document.  **1.2 Classification Samples**  It is important to work from a properly printed character sample when measuring a typeface to determine its PANOSE Classification Number. Unlike other systems of classification, a large type sample does not necessarily benefit the process of assigning PANOSE Classification Numbers, in fact, it often hinders the classification process. Keep the following concerns in mind when generating printed samples for PANOSE measurement. A sample classification sheet is available in section 9 of this document.  **1.2.1 Size**  The printed sample characters should be large enough to view the details of the characters clearly. More importantly, make certain that all the rasterization hints applied to the character form are diminished and no longer affect the glyph outline. Characters of 200 points in size are sufficient for most PANOSE classifications. The exception to this is the uppercase O, which is used to determine the Letterform and Stroke Variation digits, and the uppercase I, which is used to determine the Serif classification parameter. The measurements for these digits are quite subtle and require a significantly larger character sample; 400 points in size is usually sufficient.  **1.2.2 Resolution**  The use of low resolution output can be of assistance in determining a PANOSE Classification Number. The minute stair-steps that occur in the curves and serifs of a laser printed sample at 300 dots per inch (dpi) often indicates the inflection point of a serif from the stem, the bow of a stem, or the extreme boundary of a rounded character form. For this reason, 300-600 dpi output is recommended. Additionally, hard paper that presents each laser dot cleanly is of benefit. Resolution enhancement technology diminishes the advantages of lower resolution printing, yet will not adversely effect the correctness of the measurement attained from the sample.  **1.2.3 On-Screen Measurement**  It is quite possible to take the PANOSE measurements in a font editor software package. General illustration and drawing packages are not recommended for this process. The advantages of on-screen measurements are two fold: the measurements can be taken at any resolution and the true points of extremities and tangency can be located more precisely. The only drawback in using a font editor for PANOSE measurements is that most current tools lack elegance in the methods for measuring the distance between two random points on an outline. Undoubtedly these tools will change and improve over time, at which point on-screen measurement will provide a superior alternative to printed samples.  **1.3 Extents and Theoretical Edges**  Two general measurement terms frequently used in this documentation are “extents” and “theoretical edges.”  Extents define the upper, lower, left and right bounds of the object being described or measured. For example, the left extent of a glyph indicates the horizontal location where a vertical line first contacts the shape of the glyph. Similarly, the upper extent of the uppercase O glyph indicates the vertical location where a horizontal line first comes in contact with the glyph shape. Extents for italics are often determined on the skew.  Theoretical edges are used to indicate a straight line where a very subtle curve exists. Stem edges are often at theoretical edges because stem designs contain slightly bowed lines-not straight-lines. A theoretical edge is a line halfway between the right-most and left-most extents of the true edge of a stem.  **1.4 Baseline location**  All of the measurements necessary to determine a PANOSE Classification Number are based on the visual and physical properties of the glyph shapes, not on assumed locations of shapes, etc. The one exception to this is the baseline location. Whenever possible, use the information available from the system that is printing the character samples to indicate the correct location of the baseline. If a true baseline is not provided, the baseline is assumed to be the location of the theoretical edge of the lower edge of the lowest horizontal arm of the uppercase E. If this does not result in a horizontal line, the baseline is placed at the midpoint of the aforementioned theoretical edge.  **1.5 Digit values of 0 and 1**  The reader will notice that the value 0 and 1 are defined as Any and No Fit for every digit in the PANOSE system. These have specific meanings to the mapper. 0 means match that digit with any available digit. This allows the mapper to handle distortable typefaces such as multiple master fonts in which, for example, weights may be variable or serifs may change. 1 means that the item being classified does not fit within the present system. There are two possible causes of this. First is that there has been no work done on that family of faces, for example at the present time an Arabic cursive font would have the PANOSE number 1 1 1 1 1 1 1 1 1 1 as there has as yet been no work done on Arabic fonts. The mapper will recognize the font as having a valid PANOSE number and accept it but will only do name matching, not font substitution. The second possibility is that within the classification scheme there is nothing that fits the particular case that is being classified, for example a completely new shape of serif in a Latin Text font that does not fit the existing design space. A 1 would indicate that the serif doesn't fit but would still allow the mapper to do substitutions. If, in the process of classification, you find an example of something that does not fit within the present classification scheme, please [contact us](http://monotype.de/about/contact-us) so we can evaluate it for possible expansion of the PANOSE system. We are well aware we have not fully described the typographic universe and are prepared to extend PANOSE as the need arises. |  |

# 2.0 Latin Text

## 2.1 Family Kind

### Sub-digits

0-Any  
1-No Fit  
2-**Latin Text**  
3-Latin Hand Written  
4-Latin Decorative  
5-Latin Symbol

### Description

The overall genre of the alphabet or script that is being described is signified by the Family Kind digit. This digit consists of two parts: the script kind identifier and the genre kind identifier. In this case, the script identifier is Latin, and the genre type is described as Text, Hand Written, Decorative or Symbol. Extensions of the PANOSE system to other families of writing forms (Kanji, Hebrew, Arabic, etc.) have not been defined at the time this revision was written; [contact us](http://monotype.de/services/pan2#nolink/web/20120516160349/http://www.monotypeimaging.com/contact/default.aspx) for more information about the extensions that are currently available.

The Family Kind digit is not controlled by specific measurements, and there has been no attempt to mathematically determine the appropriate category for a given font design. Visual and aesthetic classification of Latin faces that are obviously script, decorative, or symbol fonts is required.

### General classification method

To decide whether a font belongs to the Latin Text group follow the two step process below.

A. Answer the following three questions. If they are all yes, then it belongs in this group. If the answer is still ambiguous, go to step B.

1. Does the font belong to a family that includes italic versions? Most fonts in this group have a variety of weights and most include italic versions.
2. Are the characters in the font made up of standard topologies constructed of standard parts?
3. Is some portion of the font suitable for composing a paragraph of text?

B. As a final tie breaker, look at the second digit of the Decorative ([Section 4](http://monotype.de/services/pan4)) and Handwritten ([Section 3](http://monotype.de/services/pan3)) families and see if there is something in them that fits the font in question better.

## 2.2 Serif Style Classification

### Sub-digits

0-Any  
1-No Fit  
2-Cove  
3-Obtuse Cove  
4-Square Cove  
5-Obtuse Square Cove  
6-Square  
7-Thin  
8-Oval  
9-Exaggerated  
10-Triangle  
11-Normal Sans  
12-Obtuse Sans  
13-Perpendicular Sans  
14-Flared  
15-Rounded

### Description

The most sophisticated digit in the PANOSE classification system is the Serif Style digit. This digit describes the appearance of the serifs used in a font design and groups them into one of fourteen general categories. Serif and sans serif faces are classified within this digit, though less description is given to the stem terminators of sans serif styles.

### Measurements

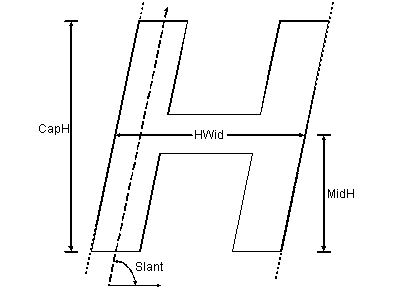
The sixteen measurements required to fully classify a serif are designed to account for the wide variety of serif styles. Once the properties of the classification system have been learned, fewer critical measurements may be needed to verify the Serif Style digit. Except where noted all of the measurements should be made on characters of the same point size.

While most calculations made to determine the Serif Style digit are ratios, the measurement system used for determining these values must be consistent for all Serif Style digits. Ratios taken against the overall uppercase height, CapH, provide this consistency.

### Measurements Taken on the Upper H

The most basic font measurements CapH, HWid and Slant are taken on the Upper H. These three variables define the basic character of the font.

**Figure 2 - Upper H**



CapH  
CapH([Figure 2](http://monotype.de/services/pan2" \l "Fig2UpperH)) is the cap height and it is measured on the uppercase H, from the top-most Y-extent to the bottom-most Y-extent along the theoretical midline of the left vertical stroke. The midline is chosen to avoid serifs that extend the height or depth of the character shape. This is a vertical measurement regardless of whether the character is italic or oblique.

Hwid  
The HWid([Figure 2](http://monotype.de/services/pan2" \l "Fig2UpperH)) is measured on the uppercase H, from the left theoretical stem edge of the left stem to the right theoretical stem edge of the right stem. It is taken along an imaginary line coincident with the average horizontal location of the character’s horizontal crossbar. The HWid measurement is used to determine Proportion.

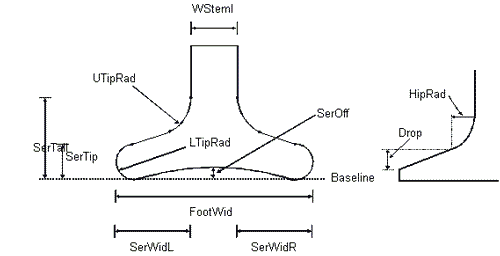
Slant  
The Slant ([Figure 2](http://monotype.de/services/pan2#Fig2UpperH)) is measured up the center of the Upper H left vertical stem, with respect to the Baseline.

MidH  
The MidH ([Figure 2](http://monotype.de/services/pan2#Fig2UpperH)) may be used in place of MidE if MidE is out of character with the face. See [Section 2.9 - Midline](http://monotype.de/services/pan2#Sec2Midline).

### Measurements taken on the Serif

The shape and proportions of the serif define much of the character of a font. The following measures are grouped to reflect their relative importance. Often a face can be classified without resorting to the last groups.

**Figure 3 - Serif Measurements**



### Universal serif measurements

SerTall  
The height of the serif, or SerTall([Figure 3](http://monotype.de/services/pan2" \l "Fig3SerifMeasurments)), is a vertical measurement taken on the lower left corner of the uppercase I, from the point that the serif departs from the vertical stem to the baseline. Note: The point of serif departure is obvious if printed samples are 300 dpi, but is less evident on high resolution output.

SerTip  
The height of the serif tip, SerTip([Figure 3](http://monotype.de/services/pan2" \l "Fig3SerifMeasurments)), is measured on the lower left-most extent of the uppercase I, from the highest extent to the lowest extent of the serif. Note: setup is measured to the bottom of the contour, not the baseline.

HipRad  
The HipRad([Figure 3](http://monotype.de/services/pan2" \l "Fig3SerifMeasurments)) measurement describes the horizontal radius of the oval often formed when the serif connects to the stem. This measurement is taken on the uppercase I glyph. The HipRad is the distance from the theoretical left edge of the stem on the lower left serif to either the left edge of the serif or the point where the curve becomes tangent with a line extending to the left edge of the serif.

Drop  
Drop([Figure 3](http://monotype.de/services/pan2" \l "Fig3SerifMeasurments)) is the most difficult serif measurement to determine. It applies only to serifed designs and cannot be measured on a serif whose HipRad value is equal to the SerWidL value. Drop assumes that there is a straight line between the left edge of the serif tip and the lowest extent of the HipRad. Drop measures the vertical distance from the top of the serif tip to the point of tangency with the bottom of the cove curve. As with the other serif detail measurements, this measurement is taken on the uppercase I.

### Measurements used to calculate overall symmetry of the serif

SerWidL  
The width of the lower left serif, or SerWidL([Figure 3](http://monotype.de/services/pan2" \l "Fig3SerifMeasurments)), is a horizontal measurement taken from the left-most extent of the serif at the base of the uppercase I, to the left edge of the vertical stem at the point of serif departure.

SerWidR  
The width of the lower right serif or, SerWidR([Figure 3](http://monotype.de/services/pan2" \l "Fig3SerifMeasurments)), is taken horizontally from the right side of the vertical stem at the point of serif departure to the right-most X-extent of the serif on the uppercase I.

FootWid  
This measurement is used to compare the overall width of the foot of a stem with the width measurement of the stem. The FootWid([Figure 3](http://monotype.de/services/pan2" \l "Fig3SerifMeasurments)) is a horizontal measurement taken at the baseline from the left-most extent to the right-most extent of the lower serif on the uppercase I.

### Measurements that apply to curved, rounded or stylized serifs

UTipRad  
The upper section of the serif tip radius, UTipRad([Figure 3](http://monotype.de/services/pan2" \l "Fig3SerifMeasurments)), is measured vertically on the lower left serif of the uppercase I. This vertical measurement defines the radius of the largest possible circle drawn within the upper portion of the serif tip while retaining the maximum points of tangency. This measurement will usually exist in glyphs with cove or exaggerated serifs. Square serifs, thin line serifs, and triangle serifs will often have zero UTipRad.

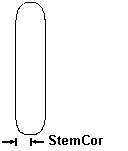
LTipRad  
LTipRad([Figure 3](http://monotype.de/services/pan2" \l "Fig3SerifMeasurments)) is similar to UTipRad, but this measurement reflects the lower left hand corner of the serif tip. Again, this is a vertical measurement taken on the uppercase I character.

SerOff  
SerOff([Figure 3](http://monotype.de/services/pan2" \l "Fig3SerifMeasurments)) or the serif offset is the vertical distance measured along the theoretical mid-point of the vertical stem from the intersection of that line with the edge of the glyph to the lowest extent of the serif on the uppercase I. SerOff is zero for glyphs that rest fully on the baseline.

### Rare visual traits to identify more unusual sanserif designs

FootPitch  
The FootPitch([Figure 10](http://monotype.de/services/pan2" \l "Fig10AMeasures)) measurement records the angle at which the stem on a sans serif uppercase A is terminated. Most often the measurement will be zero indicating that the bottom of the stem is parallel to the baseline. In some cases however, the stem is terminated perpendicular to itself, resulting in a measurement less than 170 degrees. Note: A measurement of 180 degrees is used when the stem pitch is flat.

**Figure 4** - StemCor



StemCor  
At times the corners of a sans serif glyph’s stems are rounded instead of sharp. The StemCor ([Figure 4](http://monotype.de/services/pan2#Fig4StemCor)) variable measures the horizontal radius of the lower left corner of the uppercase I. A fully rounded sans serif design would have a StemCor value equal to half the stem width.<

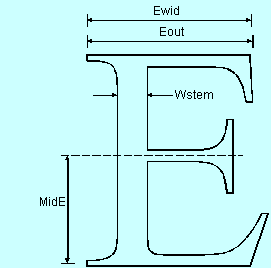
### Measurements taken on the Upper I

WStem(I)  
The I stem weight, WStem(I)([Figure 3](http://monotype.de/services/pan2#Fig3SerifMeasurments)), is measured horizontally on the uppercase I at the midpoint of the vertical stem. This measurement is the width of the vertical stem of the character, and is taken perpendicular to the stem. In the case of an oblique letter, the horizontal axis is positioned perpendicular to the stem. Note: For the purpose of serif designs, this measurement is applied to the large (400 point) uppercase I sample glyph.

### Measurements taken on the Upper E

### 

Figure 5 - Upper E



Ewid  
EWid([Figure 5](http://monotype.de/services/pan2" \l "Fig5UpperE))is a horizontal measurement that indicates the general width of the uppercase E, and is based on the point that the serif on the glyph loses tangency with the character height. This measurement is taken at the cap height line from the left-most extent of the theoretical stem edge on the uppercase E, discounting the serif, to the right-most extent of the serif. For fonts whose uppercase E stem is bowed or curved, the x-position of the left edge of the stem is placed average to the right and left extremes of the stem discounting the protrusions of serifs. The right extent of the upper arm of the uppercase E is taken from the closest vertical point on the tip of the arm to the cap height line.

Eout  
The EOut([Figure 5](http://monotype.de/services/pan2#Fig5UpperE)) measurement is taken horizontally from the left-most X-extent of the theoretical backbone (i.e. excluding the upper left serif) to the right-most X-extent of the serif on the upper-most arm of the uppercase E.

Wstem  
The width of the vertical stem, WStem([Figure 5](http://monotype.de/services/pan2" \l "Fig5UpperE)), is measured horizontally at the x-height of the uppercase E. The E stem weight is taken at a point half way between the upper two arms. This measurement is the width of the vertical stem, or back bone, of the character. This measurement is to be taken perpendicular to the stem. In the case of an oblique letter, the horizontal axis is shifted to be perpendicular to the stem. The WStem measurement is used to determine Serif Style, Weight, and Midline.

MidE  
The MidE([Figure 5](http://monotype.de/services/pan2" \l "Fig5UpperE)) variable specifies the distance of the center of the middle stem of the uppercase E from the baseline. This measurement is strictly vertical and is not changed for non-upright letterforms. If necessary, the measurement is also taken from the midpoint on the stem to avoid curvature or stem slanting that may be incorporated into the fonts design. The MidE measurement is used to determine Midline. [See section 2.9 - Midline](http://monotype.de/services/pan2#Sec2Midline).

### Calculated Variables

Once all the measured variables are complete, they are combined to create a variety of ratios called calculated variables. These are the basis of the classification algorithms that assign the PANOSE numbers.

SerProp  
SerProp = SerTall / CapH

The serif proportion is a ratio of serif height to cap height. This calculation indicates whether a serif or stem treatment is being analyzed.

FootRat  
FootRat = FootWid / WStem(I)

FootRat is used to indicate the size of a serif at the end of a glyph stem. This measurement is used to separate serif designs from sans serif designs. It is also used to determine the amount of flare in a sans serif stem end.

SymRat  
  
SymRat = SerWidL / SerWidR

SymRat defines the symmetry of the serif design. The SymRat calculation is the width of the serif on the left half of the glyph divided by the baseline width of the serif on the right half of the glyph.

TipRat  
  
TipRat = SerTip / WStem(I)

The TipRat variable is used to differentiate between flattened serifs and non-flattened (i.e. pointed or rounded) serifs. The TipRat calculation is the height of the serif tip divided by the width of the vertical stem.

HipRat  
HipRat = SerWidL-UTipRad/HipRad

The HipRat calculation describes the proportion of the curve that connects the serif with the stem to the overall serif width. Many classification decisions are based on this variable. Note: be careful to distinguish between the HipRad (hip radius) and the HipRat (hip ratio). They are easily confused.

SerOb  
SerOb = EWid / EOut

The SerOb variable is used to determine whether the serif is obtuse or non-obtuse, and is a ratio of EOut to EWid.

TipSum  
TipSum = UTipRad + LTipRad

The TipSum calculation is the sum of the upper tip radius and the lower tip radius and is used to classify whether a serif is pointed or rounded.

CuspRat  
CuspRat = SerOff / WStem(I)

CuspRat determines the proportion of a serif’s cusp to the overall width of the stem. CuspRat is calculated by dividing the amount of serif cusp by the width of the vertical stem.

SerRat  
SerRat = SerTip / SerWidL

The SerRat variable further defines classification of rounded serifs as heavy or light by dividing the height of the serif tip by the width of the serif.

SerSize  
SerSize = SerWidL / CapH

The SerSize variable defines whether serifs are over-sized or standard in width. SerSize is calculated by dividing the width of the serif by the height of the uppercase glyphs.

TRadAv  
TRadAv = (UTipRad + LTipRad)/ 2

The TRadAv, or tip radius average, indicates the average size of the serif tip corners. This variable is used to identify rounded serifs.

DropRat  
DropRat = Drop / (SerWidL-HipRad)

DropRat is used in several cases to identify triangular serif styles. DropRat indicates the slope of the top edge of a serif simply as rise over run.

RonRat  
RonRat = StemCor / WStem(I)

This variable compares the proportion of the rounding on the corners of a sans serif design to the wide stem width. A RonRat variable of .5 would indicate a fully rounded stem termination.

FlatRat  
FlatRat = TipSum / SerTip

While the tips of many serifs use rounded corners, some oval serif designs use slightly rounded corners to soften the serif. The FlatRat variable is used to indicate which serifs are completely round at the tip and which simply have rounded edges.

StepRat  
StepRat = SerTip / SerTall

The StepRat variable is used for non-coved serifs to isolate triangular serif styles. A StepRat of zero indicates that the top edge of the serif is parallel to the baseline.

### Analysis

The classification of Serif Styles uses a process of eliminating less common serif styles rather than using a simple table look-up similar to most of the other digits. The classification description walks through the process of determining the serif style, generally removing odd and rare serif styles first. Therefore, after taking sixteen measurements and nine classification steps the most common serif style, the 2-Cove serif, is identified.

### Classification

The process of elimination is quickly traversed for classifying a single face; at most, this process takes nine steps to complete. Sans serif faces are always completed in five steps. Once the process is understood, even fewer steps are required.

A brief description is given for each step in the process. This allows the processes to be traversed more quickly. Special explanations for given relationships are listed at the end. The following text is organized into six major paths. The basic flow of those paths is as follows:

Start (Determination of serif versus sans serif)

Sans Serif (Classification of the five sans serif varieties)  
Flared  
Rounded  
Perpendicular Sans Serif  
Obtuse  
Normal

Serif (Classification of exaggerated serifs and determination of the four following subpaths)  
Cove (some coves and some triangles)  
Non-cove (squares, some thins and triangles)  
Pointed (flared, some coves and triangles)  
Rounded (some thins, some coves and heaviness)

As illustrated above, different paths may yield the same classification result. This occurs when a lesser trait is used to isolate a serif early in the process.

**Start**  
The first step in classifying a serif design is to distinguish between the serif letterforms and the sans serif letterforms. The FootRat variable is used to make this first determination. If the FootRat value is less than or equal to 1.6, then the serif is further classified using the “Sans Serif Classification” description below. If the FootRat variable exceeds 1.6 the typeface is further classified as a serif design. (Note: If the FootRat variable exceeds 1.6 and the uppercase A, E, H, and N glyphs are sans serif, measure FootWid and WStem on the left stem of the uppercase H and recalculate FootRat.) This categorization of serifs based on the stem width at the base of the character allows some slight serifs to fall into the sans serif classification. This is expected. Similarly, later evaluation of some serif designs will cause them to revert back to a flared sans serif classification.

The description for further classification of serifed faces is continued after the “Sans Serif Classification”parameters detailed below.

**Sans Serif Classification**  
Classifying sans serif designs is a simple process of elimination. If the uppercase E, A, and N glyphs are serifed and the TipRat variable is greater than or equal to 0.1, jump to “[Serif Classification”](http://monotype.de/services/pan2#SerifClassification) below.

The flared serif design is the first sans serif style that is isolated and eliminated. These designs are typified by stems that widen slightly at their base. Again, the FootRat variable is used to identify these designs. In addition, the SerProp variable is used to check that the widening is not simply the attribute of a concave stem. If the FootRat value exceeds 1.05, and the SerProp is less than 0.35, then the letterform is classified as 14-Flared. All other combinations require further classification as described below.

The rounded sans serif designs are identified next. For this classification the RonRat variable is evaluated. If the RonRat value is less than 0.2 then the stem end is not considered rounded. If the RonRat value is greater or equal to 0.2 then the Serif Style is classified as 15-Rounded.

The slant of the bottom of the leg end of non perpendicular stems are now analyzed to isolate the perpendicular sans serif designs. If the FootPitch is equal to zero, then the stem end is not considered serifed. If the FootPitch is greater than zero, then the design is classified as 13-Perpendicular Sans Serif.

Finally, the remaining sans serif designs are divided into two categories: obtuse and normal. This classification is very similar to the obtuse and non-obtuse classifications provided for serif designs, yet in this case, both obtuse and acute vertical stem ends are classified together. If the SerOb value is either greater than or equal to 1.03 or less than or equal to 0.97, then the design is classified as 12-Obtuse Sans Serif. On the other hand, if the SerOb value is both less than 1.03 and greater than 0.97, then the design is classified as 11-Normal Sans Serif.

**Serif Classification**  
The first step of the serif classification is to divide the serif designs into flat-sided serifs and non-flat (pointed or rounded) serifs. TipRat and FlatRat are used to evaluate the design of the serif tip. Serifs whose FlatRat exceeds 0.8 are non-flat. Serifs whose TipRat is less than or equal to 0.25 are considered non-flat. All remaining serifs are flat.

The flat serifs are evaluated to isolate non-symmetrical serif designs. This is accomplished by comparing the width of the left side of the serif to the width of the right side of the serif using the SymRat variable. Serifs with SymRat values greater than 1.2 or less than 0.85 are considered asymmetrical. These asymmetrical serif designs are classified with the Serif Style digit 9-Exaggerated. The tolerances provided around the SymRat value allow slightly asymmetrical serifs to be categorized as symmetrical, and thus avoid being classified as exaggerated.

The flat serifs are further divided into Cove and Non-cove. A cove serif is identified when the upper connection of the serif to the stem is a curve tangent to the stem. The HipRat variable is used to isolate the cove serifs. Serifs whose HipRat is greater than 0.1 are considered coved. If the serif’s HipRat is less than or equal to 0.1, the serif design is considered non-coved. These two serif styles are further classified below in the two sections “Cove” and “Non-cove.”

Only the non-flat serifs isolated above require the classification defined in the next four paragraphs.

Two criteria are applied to the non-flat serifs to remove exaggerated serif styles. First the CuspRat variable is used to classify those serif designs that have unusually high dishing or cusping on the lower side of the serif. If the CuspRat is greater than 0.15, then the serif is considered extremely cusped and is therefore classified as 9-Exaggerated.

Similarly, serifs which are highly elongated are classified as exaggerated serifs. The SerSize variable is used to identify these serifs. If SerSize exceeds 0.19, then the serif is classified as 9-Exaggerated. If the serif size is exaggerated for the uppercase I glyph, verify that it remains exaggerated on the lower left-hand serif of the uppercase H glyph. Note: Use samples of the same point size when comparing the stem widths. Some formulas may have to be recalculated to compare against the proper stem width.

The remaining serifs are divided into two camps: pointed serifs and rounded serifs. The TRadAv variable is used to isolate these two styles. Since the TRad variables indicate the roundness of the serif tip, the average of the upper and lower edges of the tip will be greater than zero for any serif whose tip is not pointed or squarely flattened. Hence if TRadAv > 0, then the serif is further classified as a rounded serif; if TRadAv 0, then the serif is further classified as pointed. See the two sections “Rounded” and “Pointed” below for additional classification requirements of the serif designs.

**Cove**  
The flat and cove serifs require additional classification in order to separate them into the proper category. The first step is to determine the amount of drop from the height of the serif to the top of the tip. This relationship is described by the DropRat variable. If the DropRat value is greater than 0.2, then the serif is classified as steep. If the DropRat is less than or equal to 0.2, then the serif is categorized as shallow. Steep serifs require two more classification steps. Shallow serifs require only the following step.

Shallow serifs are divided into Obtuse and Non-obtuse serifs. This process is used in several areas throughout the classification of Serif Styles. Consequently this detailed information is repeated in each area to ease navigation of this document.

The SerOb variable is used to identify those serif styles that do not form square corners but rather relax into a wider obtuse angle. If SerOb is greater than 0.93, then the serif is classified as 4-Square Cove serif. If the SerOb value is less than or equal to 0.93, then the serif is classified as 5-Obtuse Square Cove serif.

The steep serifs isolated above by the DropRat variable are further classified to isolate the triangular serifs. If the cove on the serif covers less than roughly one third of the serif width, the serif is classified as a triangle. Hence, if HipRat 0.35, then the serif is classified as 10-Triangle serif.

For serifs that have a HipRat greater than 0.35, a final refinement into obtuse and non-obtuse serifs is required. This follows the same logic described above using the SerOb variable. If SerOb is greater than 0.93, then the serif is classified as 4-Square Cove serif. If on the other hand, the SerOb value is less than or equal to 0.93, then the serif is classified as 5-Obtuse Square Cove serif.

**Non-cove**  
Of the three possible outcomes for a flat, non-cove serif design, the triangular serifs are isolated first. A comparison between the height of the serif tip and the overall height of the serif is used to make this determination. If StepRat is less than or equal to 0.85, then the upper serif edge is steep enough to be classified as 10-Triangular serif. If the StepRat is greater than 0.85, then the serif requires further classification as described below.

The remaining flat, non-coved serifs are divided into two categories, thin serifs and square serifs. This is accomplished by once again referring to the TipRat variable. If the TipRat value is greater than 0.35, then the serif is classified as 6-Square serif. If, however, the TipRat is less than or equal to 0.35, the serif is classified as 7-Thin serif.

**Pointed**  
The pointed serifs are now checked to determine if they fall into the class of minute serifs in the Flared serif category. The SerSize variable is used to isolate the flared serifs. If the SerSize is less than or equal to 0.09 then the serif is classified as 14-Flared. A SerSize greater than 0.09 is considered normal and the design requires further classification.

The Triangle Serifs are also separated in this path of the classification. The HipRat variable indicates the proportion of the cove of the serif to the overall serif width. If the HipRat is less than 0.3, then the serif is classified as a 10-Triangle serif.

Pointed serifs with a HipRat variable greater than or equal to 0.3 are classified into one of two remaining categories: obtuse and non-obtuse. The SerOb variable identifies those serif styles that do not form square corners but rather relax into a wider obtuse angle. If SerOb is greater than 0.93, then the serif is classified as 2-Cove serif. If on the other hand the SerOb value is less than or equal to 0.93, then the serif is classified as 3-Obtuse Cove serif.

**Rounded**  
As with the flat serifs above, the first criteria used to further classify the rounded serifs is the size of the cove or curved connection joining the serif to the stem. If the HipRat variable has a value greater than 0.15, then the serif requires additional classification as a coved rounded serif. However, if the HipRat is less than or equal to 0.15, then the serif is treated as if it has no rounding to the corner and is classified as 7-Thin.

At this point the SerRat variable is used to identify those serif designs that are unusually deep or oval from the rounded, coved serifs. If SerRat is greater than or equal to 0.55 then the Serif Style is classified as 8-Oval. Note: the 8-Oval Serif Style was originally referred to as the 8-Bone Serif Style or the 8-Heavy Serif Style. The new term, 8-Oval, replaces the terms 8-Bone and 8-Heavy.

The remaining rounded serifs are divided into two categories: obtuse and non-obtuse. This process is identical to the process described in the pointed serif classification. The SerOb variable is used to identify those serif styles that do not form square corners but rather relax into a wider obtuse angle. If SerOb is greater than 0.93, then the serif is classified as 2-Cove serif. If on the other hand the SerOb value is less than or equal to 0.93, then the serif is classified as 3-Obtuse Cove serif.

### Notes

Serif styles represent the most widely varied design element for most text based typeface designs. There will be several designs that are not overtly decorative, yet do not conform to the descriptions specified above. Notify Hewlett-Packard with serifs that are inconsistent with the above model. Notification of serifs that do not conform will help us better understand and extend the system for future use.

A few fonts will have different serif classifications based on their weight. An attempt has been made to keep these occurrences to a minimum yet several known inconsistencies still appear. A case in point is Garamond Ultra: the normal Roman weights of Garamond are classified as a 2-Cove Serif, the heavier weights of Garamond usually result in an 8-Oval serif classification. In these cases, or any other instance of family discontinuity, record the serif style based on the measured information, not based on classification values of the lighter weights.

## 2.3 Weight

### Sub-digits

0-Any  
1-No Fit  
2-Very Light  
3-Light  
4-Thin  
5-Book  
6-Medium  
7-Demi  
8-Bold  
9-Heavy  
10-Black  
11-Extra Black

### Description

The Weight digit classifies the appearance of a fonts’ stroke thickness in relation to its height. This is expressed as a comparison of the measurements taken on the uppercase E glyph and the Upper H used before.

### Measurements

Two measurements are required for classification of the Weight digit.

CapH  
The same measurement used in the start of the serif classification is used to begin the weight classification. CapH ([Figure 2](http://monotype.de/services/pan2#Fig2UpperH)) is the cap height and is measured on the uppercase H, from the top-most Y-extent to the bottom-most Y-extent at the theoretical midline of the left vertical stroke. The midline is chosen to avoid serifs that extend the height or depth of the character shape. This is a vertical measurement even if the glyph is italic or oblique.

WStem(E)  
The width of the vertical stem, WStem(E) ([Figure 5](http://monotype.de/services/pan2#Fig5UpperE)), is measured horizontally on the uppercase E at a point halfway between the upper two arms. This measurement is the width of the vertical stem, or back bone, of the character and is taken perpendicular to the stem. In the case of an oblique letter, the horizontal axis is shifted to be perpendicular to the stem. Note: For the purpose of serif designs, this measurement is applied to the large (400 point) uppercase I glyph. This measurement is used to set the nominal weight of the overall font.

### Calculated Variables

Only one calculated variable (WeightRat) is used to determine the Weight digit for the PANOSE Typeface Matching System. The WeightRat variable is calculated by dividing the cap height by the width of the vertical stem.

WeightRat = CapH / WStem(E)

### Classification

To determine the exact PANOSE Weight digit, round the WeightRat value to two decimal places and match it in the following table:

0-Any  
1-No fit  
2- Very Light …………………WeightRat 35  
3-Light………………… 18 WeightRat < 35  
4-Thin……………………10 WeightRat < 18  
5-Book ………………….7.5 ; WeightRat < 10  
6-Medium……………….5.5 WeightRat < 7.5  
7-Demi ………………….4.5 ; WeightRat < 5.5  
8-Bold …………………..3.5 ; WeightRat < 4.5  
9-Heavy………………… 2.5 ; WeightRat < 3.5  
10-Black………………… 2.0 ; WeightRat < 2.5  
11-Extra Black………………… WeightRat < 2.0

### Notes

The tolerances of the weight classification have been determined by testing a variety of fonts. While this has provided reasonable averages for the ranges of weights, these will not always directly correspond with a font’s external name. It is not uncommon to have a font that contains the word “Bold” in the name that actually classifies as 7-Demibold, etc.

In addition, certain families that have a surplus of font weights may not progress smoothly through the differing classification options. It is, however, rare that two members within the same family will have two weights that exist in the same classification category.

Caution on measurements: When measuring a design with a highly rounded or bowed inside stem, be certain to calculate the correct theoretical edge for the location of the stem edge. Curved stems can alter the measurements for classification significantly enough to alter the resulting category. A face such as Optima can classify quite differently if the WStem is incorrectly measured at the narrowest or widest portion of the stem.

## 2.4 Proportion

### Sub-digits

0-Any  
1-No fit  
2-Old Style  
3-Modern  
4-Even Width  
5-Extended  
6-Condensed  
7-Very Extended  
8-Very Condensed  
9-Monospaced

### Description

The proportion of a font in the PANOSE Typeface Matching System is defined in greater detail than simply an indication of general glyph shape aspect ratio such as extended and condensed. It also compares the relative widths of a few standard characters that are often varied by type designers to give their typeface a certain historical or legible appearance.

Within the Proportion trait three different proportion schemes are considered: normal, distorted, and monospaced. Within these different schemes several alternatives are listed. For example, there are three variants on proportion that fall under the general normal class. These are Old Style, Modern, and Even Width. Similarly, there are four variants of distorted: Extended, Condensed, Very Extended, and Very Condensed.

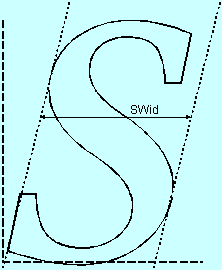
### Measurements

Eight measurements are necessary to fully classify the proportion of a font into one of nine Proportion digits.

Ewid  
First mentioned in the Serif classification, the EWid ([Figure 5](http://monotype.de/services/pan2#Fig5UpperE))is a horizontal measurement that indicates the general width of the uppercase E. This measurement is taken at the cap height line from the left-most extent of the theoretical stem edge on the uppercase E, discounting the serif, to the right-most extent of the serif at the cap height line.

For fonts that have a bowed or curved stem on the uppercase E, the x-position of the left edge of the stem is placed average to the right and left extremes of the stem discounting the protrusions of serifs. The right extent of the upper arm of the uppercase E is taken from the closest vertical point on the tip of the arm to the cap height line.

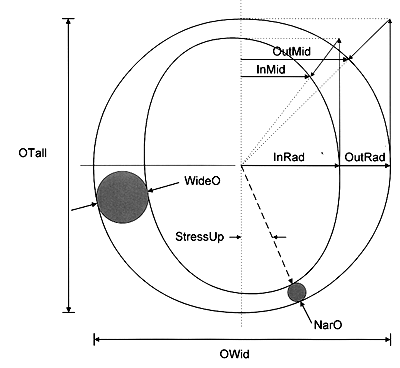
**Figure 6 - Upper S**



Swid  
The uppercase S glyph is used to measure the SWid([Figure 6](http://monotype.de/services/pan2" \l "Fig6UpperS)) variable. This horizontal measurement is taken from the left-most extent of the upper bowl to the right-most extent of the lower bowl. Because these two points will not fall on the same horizontal plane, skewing is required for italic glyphs. The skewing angle used for this measurement should be the same as that derived in the skew measurement taken on the uppercase H in the serif classification digit (the eighth PANOSE digit).

Hwid  
The HWid ([Figure 2](http://monotype.de/services/pan2#Fig2UpperH)) is measured on the uppercase H, from the left theoretical stem edge of the left stem to the right theoretical stem edge of the right stem. It is taken along an imaginary line coincident with the average horizontal location of the bottom of the horizontal crossbar of the character.

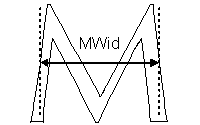
**Figure 7 - Upper O**



OWid  
OWid ([Figure 7](http://monotype.de/services/pan2#Fig7UpperO)) is the horizontal measurement that reflects the general width of the uppercase O glyph. It is measured from the left-most extent of the left side of the stroke, to the right-most extent of the right side of the stroke. The uppercase O glyph sample being measured should be the same size font as was used on the S glyph used for the SWid measurement. Again, as with the SWid, if a skewed, italic, or oblique font is being classified, be certain to skew the left and right locations in order to obtain a true horizontal measurement.

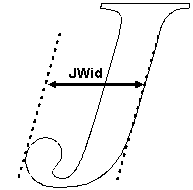
OTall  
OTall ([Figure 7](http://monotype.de/services/pan2#Fig7UpperO)) depicts the height of the uppercase O glyph. It is a vertical measurement from the outside edge of the stroke at the top-most extent to the outside edge of the stroke at the bottom-most extent of the glyph. Skewed, italic, or oblique characters should not skew this measurement. It should remain strictly vertical. The uppercase O glyph should be the same size font as the S glyph used for the SWid measurement. Note: OTall will generally be slightly larger that CapH due to the subtle Baseline and Capline overlaps.

**Figure 8 - MWid**



MWid  
Due to various topological variations used in the uppercase M character, the MWid([Figure 8](http://monotype.de/services/pan2" \l "Fig8UpperM)) measurement is taken differently from the EWid[(Figure 5](http://monotype.de/services/pan2#Fig5UpperE)), HWid([Figure 2](http://monotype.de/services/pan2#Fig2UpperH)), and SWid([Figure 6](http://monotype.de/services/pan2#Fig6UpperS)) measurements. The horizontal width of the uppercase M glyph is measured at the exact mid-height of the glyph from the left-most edge of the stroke on the left stem to the right-most edge of the stroke on the right stem. No approximations of theoretical edges are used for this measurement, nor are any alterations required for skewed glyphs.

**Figure 9 - JWid**



Jwid  
The width of the uppercase J, JWid([Figure 9](http://monotype.de/services/pan2" \l "Fig9JWid)), is a horizontal measurement from the right theoretical edge of the stem to the left-most extent of the bowl or tail of the glyph, including any serif extensions on the left side. Again, in this case, since the two points may not fall on the same horizontal plane, the measurements must be skewed for non-upright glyphs.

CapH  
The CapH ([Figure 2](http://monotype.de/services/pan2#Fig2UpperH)) is used again in the determination of proportion measurement used to specify the cap height and is measured on the uppercase H, from the top-most Y-extent to the bottom-most Y-extent along the theoretical midline of the left vertical stroke. The midline is chosen to avoid serifs that extend the height or depth of the glyph. This is a vertical measurement, regardless of italic or oblique stress.

### Calculated Variables

There are eight calculated variables used to determine the correct Proportion digit for a typeface design:

ThinAv = (EWid + SWid) / 2  
WideAv = (OWid + HWid) / 2  
CalcEm = CapH \* 1.5  
ThinRat = CalcEm / ThinAv  
WideRat = CalcEm / WideAv  
PropRat = WideRat / ThinRat  
JMRat = JWid / MWid  
ORat = OTall / OWid

### Classification

The objective of the Proportion category is to evaluate the relative widths of specific characters and assign the typeface into one of nine PANOSE Proportion digits. This is accomplished by first removing the non-normal proportioned glyphs and then segmenting the remaining designs into one of three normal proportion genres. These variables are set up such that the character widths themselves are not evaluated but rather the aspect ratios of these glyphs by setting them against a calculated Em width.

To isolate monospaced font designs, the ratio of the width of the uppercase J to the width of the uppercase M (JMRat) is evaluated. More than any other two characters in the Latin glyph set, these two characters can readjust their character shape in order to better conform to a uniformly spaced font. If the JMRat is greater than or equal to 0.78 the font is classified as 9-Monospaced. The monospaced fonts are classified first because they are often condensed in appearance in addition to being monospaced in design.

For those fonts not classified as monospaced, the shape of the uppercase O is evaluated to identify unusually narrow or wide glyph shapes. The ratio of the width to the height of the uppercase O glyph is reflected in the ORat variable. If ORat is greater than or equal to 1.27, the font is classified as 6-Condensed. Further, if ORat is greater than or equal to 2.0, the PANOSE digit for Proportion is 8-Very Condensed.

Similarly, the extended fonts are also identified by examining the ORat variable. In this case the font is classified as 5-Extended if ORat is greater than or equal to 0.90 and less than 0.92. If the ORat value is less than 0.90 the font is further classified as 7-Very Extended.

Finally, those fonts not yet classified are evaluated by stricter criteria to separate them into three normal proportion schemes. The PropRat value can be inserted into the table below to obtain the PANOSE Proportion digit for these faces:

2-Old Style…………………… PropRat < 0.70  
3-Modern……………….0.70 PropRat < 0.83  
4-Even Width …………..0.83 PropRat < 0.90

The nine classifications for the Proportion digit are as follows:

0-Any  
1-No Fit  
2-Old Style……………… JMRat < 0.78 and 0.92  ORat < 1.27 and PropRat < 0.70  
3-Modern …………………JMRat < 0.78 and 0.92  ORat < 1.27 and 0.70  PropRat < 0.83  
4-Even Width………………JMRat < 0.78 and 0.92  ORat < 1.27 and 0.83  PropRat  0.91  
5-Extended …………………JMRat < 0.78 and 0.90  ORat  0.92  
6-Condensed ………………JMRat < 0.78 and 1.27  ORat < 2.1  
7-Very Extended………….. JMRat < 0.78 and 0.85  ORat < 0.90  
…………………………………(if ORat < 0.85 go to [Decoratives - Section 4](http://monotype.de/services/pan4/))  
8-Very Condensed………… JMRat < 0.78 and 2.1  ORat < 2.6  
…………………………………(if ORat > 2.1 go to [Decoratives - Section 4](http://monotype.de/services/pan4/))  
9-Monospaced……………. JMRat  0.78

### Notes

PANOSE’s Proportion digit has very narrow tolerances overall for the different classification options. There will be several cases where common knowledge of historical typographic attributes will conflict with the categories that the measurements prescribe for classifying a face. In these cases, the measurements win out over the characteristic design of the face.

Separate definition of the monospaced attribute is provided to differentiate these typographically constrained faces. A few typefaces will be isolated by the JMRat evaluation that are not truly monospaced fonts. Most prone to this error are modern faces with nearly even widths or condensed faces. Since character advancement width metrics are not evaluated in the PANOSE Typeface Matching System, there is no visual grounds for correctly identifying a monospaced font. If the face being classified is known to contain monospaced character widths, the digit 9-Monospaced can be assigned even if the JMRat test fails to validate this classification.

Similarly, if a known proportionally spaced font happens to be isolated as monospaced due to the glyph design of the uppercase J and uppercase M, the monospaced classification can be ignored and the font can be classified by using the subsequent parameters. This subjective dismissal of a PANOSE trait is highly unusual and is an exception to the rule.

Since the tolerances are so tight for the three proportion options of Old Style, Modern, and Even Width, some fonts will straddle these boundaries and end up with different proportional classification due to changes in their weight or style. The font should always be classified by the results of the PropRat variable in these cases, not by what the majority of the family is assigned or what the known historical information may indicate.

Similarly there will be rare cases where a typically non-condensed face uses a narrow enough uppercase O glyph to be classified as a condensed letterform and visa versa. Again, enter the number dictated by the classification system, rather than the name of the font. There are several faces that appear condensed whose names do not contain the word “condensed.”

Also note that extremely condensed or extended designs are usually classified as Decoratives. If ORat exceeds the limits listed above, it is good evidence that a Decorative classification should be considered (see Section 4).

## 2.5 Contrast

### Sub-digits

0-Any  
1-No Fit  
2-None  
3-Very Low  
4-Low  
5-Medium Low  
6-Medium  
7-Medium High  
8-High  
9-Very High

### Description

The Contrast digit describes the ratio between the thickest point on the stroke of the letter O and the narrowest point on the letter O. This ratio is called the ConRat and involves two relatively straight forward measurements.

The glyph shape of the uppercase O is used to calculate the contrast digit because it is generally of higher contrast than the other characters of the alphabet. For instance, the thick segments of the uppercase O are wider than the thick segments of other letters of the alphabet. This measurement of contrast with the rounded character shapes is used because it emphasizes the contrast of the character shape, thus giving greater separation of visual traits in classification. The ratio of narrow to wide is used for contrast because it defines the degree of variation in the letterform as it changes from thick to thin.

This measurement should not be confused with the sixth PANOSE digit, Stroke Variation. Stroke variation classifies the transition process between the thick and thin segments of the uppercase O, the relative values themselves.

### Measurements

The contrast digit is calculated using two measurements, WideO and NarO ([Figure 7](http://monotype.de/services/pan2#Fig7UpperO)). These two measurements are often quite simple to determine. With advanced or calligraphic character shapes determining the location where the stem is at its maximum or minimum width is often more challenging. For this reason, it is recommended that a large sample is used to calculate the Contrast digit.

WideO  
This variable is assigned by measuring the stem of the uppercase O glyph where it is thickest. Often this will be at the right or left-most extent of the letter-form, measured in a horizontal line. Note: **DO NOT CONFUSE WITH OWID! OWid specifies the character width rather than the stroke width**.

NarO  
Similar to WideO, this variable is assigned by measuring the narrowest point of the uppercase O glyph, usually the top most extent of the letter-form and, in this case, is measured vertically.

If diagonal stress has been applied to the shape of the uppercase O glyph the points of highest contrast may not occur at the top and bottom or furthest left and right extent of the glyph. In this case, WideO and NarO are the positions on the glyph where the difference between the inside and outside radials has the maximum and minimum value respectively.

The rule for determining the radials for the purpose of this classification method is that they must cross the outer edge of the glyph perpendicular to a line that is tangent to the stroke. The radials can usually be determined by locating the character center and drawing a line straight out through the glyph. Yet, in some exaggerated letterforms, specifically flattened, rounded, or off-center glyph shapes, a center-based radial will not provide a measurement that is perpendicular to the stroke. In these complex character shapes, the WideO and NarO must be measured using the radial differences method mentioned in the previous paragraph.

### Calculated Variables

ConRat  
ConRat = NarO / WideO

If the ConRat variable is greater than one, there is horizontal stress on the letter; This indicated that the font should be classified as a Decorative design ([Section 4](http://monotype.de/services/pan4/)).

### Classification

To determine the exact PANOSE digit for contrast, fit the contrast ratio (ConRat) into the following table:

0-Any  
1-No Fit  
2-None……………….. 0.80 < ConRat  
3-Very Low………….. 0.65 < ConRat  0.80  
4-Low …………………0.48< ConRat 0.65  
5-Medium Low……….. 0.30 < ConRat  0.48  
6-Medium……………. 0.20 < ConRat  0.30  
7-Medium High ……….0.15 < ConRat  0.20  
8-High………………… 0.08 < ConRat  0.15  
9-Very High………………… ConRat  0.08

### Notes

This digit only evaluates a glyph’s contrast, which in this case is described by the ratio between the thickest and the narrowest points on the uppercase O. The angle of the stress and speed with which the character’s stem width tapers from thick to thin are handled by subsequent PANOSE digits.

It is not necessary to record the location where WideO and NarO are measured to determine a font’s contrast. However, these positions will be required for later classification of the sixth PANOSE digit, Stroke Variation.

While the contrast calculation does not require modifications to the measurement process for classification f italic characters, note that italic variations of roman letter-forms commonly have lower contrast than their non-italic counterparts. This can cause families to break across different contrast settings due to changes in the italic design. A simple oblique rendition of a standard symmetrical design will not effect the contrast value.

Similarly, a glyph’s contrast classification may change as the weight changes. For example, a typeface classified as having medium contrast in a low weight design may have increased contrast when the weight increases. Similarly, if a font is classified as having high contrast it is likely that the contrast will decrease as the weight increases. PANOSE does not regularize these values across typeface families, but instead accepts them as a visual change that is weight dependent.

A stencil, script, or overly decorative character that does not have a closed path, or form a continuous circle is classified as having a contrast of 1-No fit. This should be treated as a warning sign that possibly classification as Handwritten (Section 3) or Decorative (Section 4) will be more suitable for this face.

Notice that some contrast can exist in faces that are classified as 2-No Contrast. This is representative of the fact that typefaces are rarely designed with absolutely no contrast. Even glyphs that appear to have consistent stroke thickness throughout the letter-form, generally employ some amount of contrast. The contrast classification of 3-Very Low addresses glyphs where the alteration of the weights of the thick and thin stems begins to become visually apparent rather than an optical embellishment.

## 2.6 Stroke Variation

### Sub-digits

0-Any  
1-No Fit  
2-No Variation  
3-Gradual/Diagonal  
4-Gradual/Transitional  
5-Gradual/Vertical  
6-Gradual/Horizontal  
7-Rapid/Vertical  
8-Rapid/Horizontal  
9-Instant/Vertical  
10-Instant/Horizontal

### Description

The contrast classification of a given font specifies the relationship between the thicknesses of the thin stems and the wide stems. The Stroke Variation category further details the contrast trait by describing the kind of transition that occurs as the stem thickness changes on rounded glyph shapes. Two attributes of transition are classified, the angle of the transition and the speed of the transition. Note: If the previous digit (Contrast) resulted in 2-No Contrast, then the Stroke Variation digit is 2-No Variation.

### Measurements

The speed of the transition of the stem weight in rounded characters is classified by comparing the curvature of the outer edge of the glyph to the curvature of the inner edge.

PANOSE uses a unique and simple method for determining the conformance of any given ellipse to a purely oval path. These measurements are the most specific in the PANOSE Classification Metrics Guide and require extreme precision. Whenever possible, the measurements should be taken from a sample that is 400 points in size. Computer-generated 0.25 point vertical and horizontal rules are also very useful.

OutRad  
OutRad([Figure 7](http://monotype.de/services/pan2" \l "Fig7UpperO)), or the outer radius, is a horizontal measurement taken on the uppercase O, from the center of the glyph to the right-most extent of the glyph shape.

OutMid  
There are several steps involved in determining the OutMid([Figure 7](http://monotype.de/services/pan2" \l "Fig7UpperO)) measurement. The upper right corner of the uppercase O is used to determine the OutMid. The OutMid is a horizontal measurement that extends from the middle of the character to the character edge. Unlike the OutRad, the vertical placement of this measurement is not at the mid point of the glyph, but rather at a point specified by the intersection of a diagonal bisecting line referred to as the Inter-edge line.

The Inter-edge line is drawn from the glyph center to the intersection of two lines, one horizontal and one vertical, that indicate the vertical location of the upper extent of the character and the horizontal location of the right-most extent of the character. On a perfect circle, the resulting Inter-edge line is at a 45º angle.

With the Inter-edge line correctly drawn, the OutMid can be determined. It is a horizontal measurement taken from the horizontal mid point of the glyph to the point where the Inter-edge line intersects the outer edge of the glyph shape.

In non-upright characters, all vertical lines for measuring distances are skewed to match the oblique angle.

These two variables, OutRad and OutMid, are used to determine the curvature of the outer ellipse of the uppercase O glyph. These same measurements will be used later in the Letterform category to assign an overall character roundness value to a given font. To determine the speed of stoke transition, the curvature of the inner ellipse of the uppercase O must also be determined. The same process described above is repeated for the inside of the uppercase O glyph with InRad and InMid.

InRad  
InRad([Figure 7](http://monotype.de/services/pan2" \l "Fig7UpperO)) is the inside radius of the uppercase O. This horizontal measurement is taken on the same line used for OutRad, but the measurement is taken from the center of the glyph to the inside edge of the right stroke of the character.

InMid  
This measurement is similar to the OutMid([Figure 7](http://monotype.de/services/pan2" \l "Fig7UpperO)) measurement; in this case the Inter-edge line is drawn from the upper and right-most extents of the inner ellipse of the uppercase O.

It is a common measurement error to use the wrong Inter-edge line when both the InMid and the OutMid are measured on the same sample. Always verify that the correct Inter-edge line is being used for the correct variable measurement.

StressUp  
The angle of the stress of the rounded glyphs is characterized by locating the point at which the outer ellipse and inner ellipse of the uppercase O are closest together and measuring that point’s angle to the center of the glyph. Intuitively picture the inner and outer ellipses as rails; the goal is to see where a ball that rolls between those rails fits the tightest.

Mathematically, the location can be found by locating the smallest value returned when measuring a line that is tangent to the outer ellipse to where that line crosses the inner ellipse. Once that point is determined, a line is drawn from that point to the center of the glyph. The line formed is the StressUp (Figure 7) value.

StressLo  
The StressLo variable is similar to the StressUp variable, except in this case the measurements are taken on the lowercase o.

### Calculated Variables

There are three calculations necessary to determine a font’s stem transition speed.

OutCurv = OutMid / OutRad  
InCurv = InMid / InRad  
Speed = OutCurv / InCurv

The resulting Speed variable is then fit into the “Speed Table” below to obtain the transition speed attribute.

Speed Table:  
Speed  .96 …………= Gradual  
.85 < Speed < .96 ….= Rapid  
Speed  .85 ………= Instant

The stress of the uppercase and lowercase O (CapStress and LowerStress) is used to normalize oblique glyphs.

CapStress = StressUp - Slant  
LowerStress = StressLo - Slant

### Classification

The stroke variation digit is 2-No Variation if the previous digit resulted in 2-No Contrast. If the font has contrast, the transition speed is assigned for the font. If the speed is less than or equal to 0.85, the typeface is classified with the Stroke Variation value, Instant. If the Speed value is greater than or equal to 0.96, the font is classified as having Gradual speed. Finally, if the Speed values lies between 0.85 and 0.96 it is classified as Rapid.

The Stroke Variation classification continues by evaluating the stress of the uppercase O glyph.

If StressUp is less than or equal to 98º and greater than or equal to 82º, the stress of the lowercase is also evaluated. If the value for StressLo is also less than or equal to 98º and greater than or equal to 82º, the font is classified as having Vertical stress. If the value for StressLo is greater than 98º or is less than 82º, the font is classified as having Transitional stress.

If the StressUp value is greater than 98º and less than or equal to 172º, it is not necessary to check the StressLo variable. The font is classified as having Diagonal stress.

Finally if the StressUp variable is greater than or equal to 172º and less than or equal to188º, the font is classified as having Horizontal stress.

You can determine the stress based on the following information:

Horizontal = CapStress = 0 ± 8, or 180 ± 8  
Vertical = CapStress = 90 ± 8  
If vertical check LowerStress  
if LowerStress = CapStress, stress is Vertical  
if LowerStress CapStress, stress is Transitional  
All else is Diagonal

0-Any  
1-No Fit  
2-No Variation  
3-Gradual/Diagonal …………Speed 0.96 and 98º < StressUp< 172º  
4-Gradual/Transitional ……..Speed 0.96 and [(82º StressUp 98º) and (StressLo >98ºor StressLo > 82º)]  
………………………………OR[(Slant < 82º or Slant >98º) and |CapStress| <8 and |LowerStress|  8]  
5-Gradual/Vertical …………Speed  0.96 and [(82º StressUp 98º) and (82º StressLo 98º)]  
………………………………OR [(Slant < 82º or Slant >98º) and |CapStress| <8 and |LowerStress| < 8]  
6-Gradual/Horizontal………Speed  0.96 and 172º StressUp 196º and 172º StressLo 196º  
7-Rapid/Vertical……………0.85 < Speed < 0.96 and [(82º StressUp 98º) and (82º StressLo 98º)]  
………………………………OR [(Slant <82º or Slant > 98º) and |CapStress|< 8 and |LowerStress| <8]  
8-Rapid/Horizontal…………0.85 < Speed < 0.96 and 172º StressUp 196º and 172º StressLo 196º  
9-Instant/Vertical…………Speed 0.85 and [(82º StressUp 98º) and (82º StressLo 98º)]  
………………………………OR [(Slant <82º or Slant > 98º) and |CapStress|<8 and |LowerStress| <8]  
10-Instant/Horizontal ……..Speed 0.85 and 172º StressUp 196º and 172º StressLo 196º

### Notes

If you examine the logical cross products of the different attributes that are classified in this category, you will notice that some combinations are not available, such as Rapid Transitional and Rapid Diagonal. These have been omitted due to their extreme rarity. If in the course of your classification you run across a hybrid mix of attributes such as these, the following priorities will determine the correct classification: for speeds above .85, speed is the determining characteristic; for speeds below .85, stress is the determining characteristic.

## 2.7 Arm Style

### Sub-digits

0-Any  
1-No Fit  
2-Straight Arms/Horizontal  
3-Straight Arms/Wedge  
4-Straight Arms/Vertical  
5-Straight Arms/Single Serif  
6-Straight Arms/Double Serif  
7-Non-Straight/Horizontal  
8-Non-Straight/Wedge  
9-Non-Straight/Vertical  
10-Non-Straight/Single Serif  
11-Non-Straight/Double Serif

### Description

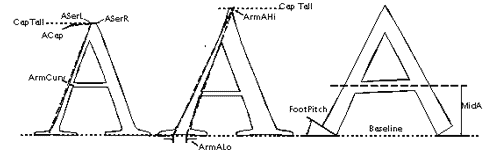
The Arm Style category classifies two attributes of a glyph design: special treatment of diagonal stems and termination of open rounded letterforms. Most font designs will classify as Straight Arms/Wedge or Straight Arms/Single Serif. The uppercase A and C are used extensively for this classification. Other letters which determine the Arm Style setting are uppercase G, M, S, V, W, and Y.

### A Measurements

### 

Figure 10 - Upper A Measurements

### 

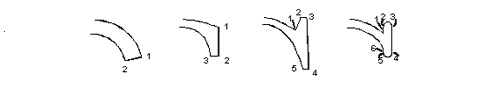


ArmAHi ArmALo  
The thickness of the left diagonal stem of the uppercase A is described by the ArmAHi and ArmALo([Figure 10](http://monotype.de/services/pan2" \l "Fig10AMeasures)) variables. These measurements are taken by projecting the theoretical stem edges of the left stem out to the baseline and capline of the letter. The ArmAHi measurement is then determined by measuring the thickness of the stroke at the capline. Similarly, the ArmALo is measured at the baseline. Both measurements are taken perpendicular to a line that depicts the middle of the stem.

ArmCurv  
The curvature of the diagonal arms is captured by the ArmCurv([Figure 10](http://monotype.de/services/pan2" \l "Fig10AMeasures)) variable. This measurement is taken at the mid point of an imaginary line which is drawn from the point where the left theoretical edge of the uppercase A intersects the baseline and capline. This line will often be coincident with the edge of the stem; the cases when this is not true need to be measured. The measurement is taken from the mid point of the imaginary line to the actual left edge of the stem. In the case of a concave stem this will result in a negative number, in the case of a bowed stem this will result in a positive number.

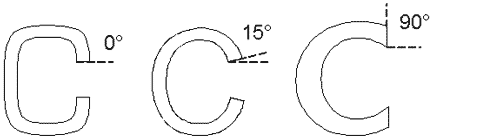
CapH  
CapH([Figure 2](http://monotype.de/services/pan2" \l "Fig2UpperH)) is the cap height and it is measured on the uppercase H, from the top-most Y-extent to the bottom-most Y-extent along the theoretical midline of the left vertical stroke. The midline is chosen to avoid serifs that extend the height or depth of the character shape. This is a vertical measurement regardless of whether the character is italic or oblique.

**Figure 11 - Cut Count**



CutCountHi CutCountLo  
The two CutCount ([Figure 11](http://monotype.de/services/pan2#Fig11CutCount))variables depict the number of corners at both terminations of the uppercase C. This measurement is only applied to serif letter forms and indicates the amount of serif detailing at the ends of the stroke. The procedure for this variable is loosely defined so as not to impede the simple goal of this attribute. Each surface of the detail at the termination of the C that is not a part of the major curve of the glyph is determined. From these surfaces the corners are counted and those counts determine the values for the CutCount variables. This process is completed for both the upper and lower termination of the uppercase C.

**Figure 12 - Cut Pitch**



CutPitch  
The angle of termination on an uppercase C for a sans serif glyph is stored as the CutPitch([Figure 12](http://monotype.de/services/pan2" \l "Fig12CutPitch)). This measurement is not taken on serif letterforms. The angle produced by the two points that terminate the upper stroke of the uppercase C is used to describe this variable. The left-most of the two points is used as the fulcrum of the angle. In the case of a highly rounded corner style at the termination of the stroke, the theoretical edge of the stroke must be determined and its angle recorded. The treatment of the lower termination of the stroke is not factored into this attribute.

### Calculated Variables

TaperRat = ArmAHi / ArmALo  
CurvRat = ArmCurv / CapH  
CutRat = CutCountLo / CutCountHi

### Classification

Of the two traits that are classified in this category, the arm is determined first. The termination treatment is determined separately as a second process.

There are three different kinds of non-straight arms that are classified in this category. They are: tapered (or non-parallel), bowed, and concave. Different variables are evaluated to check for the existence of these different arm styles.

To assess whether the arms are non-straight the difference between the ArmAHi and ArmALo values are checked. This is done by evaluating the TaperRat variable. The arm is considered non-parallel if the TaperRat is less than 0.6.

Bowed and concave arms are isolated with the CurvRat variable. If the absolute value of CurvRat is greater than or equal to 0.02 then the arm is considered non-straight. Notice that the CurvRat will not indicate whether the arms are bowed or concave, only that they are not straight. The CurvRat variable will result in an error if the arm is completely straight.

Next, evaluate the treatment of the uppercase C opening. CutPitch is used for analysis of sans serif faces (10 < digit 2 <14).

353º < CutPitch 7º = Horizontal  
7º < CutPitch 83º = Wedge  
83º < CutPitch < 112º = Vertical

The CutCount values compare the complexity of the upper and lower serifs on the uppercase C glyph. This step is overly complex for manual classification of faces. The CutCount values are helpful if you are writing programs to classify type. CutCount is used to distinguish between a single or double serif termination on the uppercase C. If a face is difficult to determine, use the rule: CutRat  0.75 = Single Serif.

The attributes of “Straight” or “Non-Straight” arms are paired with the attributes of “Horizontal,” “Wedge,” “Vertical,” “Single Serif,” or “Double Serif” to determine the final classification digit for Arm Style in the table below:

0-Any  
1-No Fit  
2-Straight Arms/Horizontal …………TaperRat  0.60 or CurvRat < 0.02 and CutPitch < 7  
3-Straight Arms/Wedge…………….. TaperRat 0.60 or CurvRat < 0.02 and 7º < CutPitch < 83º  
4-Straight Arms/Vertical…………… TaperRat  0.60 or CurvRat < 0.02 and 83º < CutPitch < 112º  
5-Straight Arms/Single Serif ………..TaperRat  0.60 or CurvRat < 0.02 and CutCount 0.75  
6-Straight Arms/Double Serif ……….TaperRat  0.60 or CurvRat < 0.02 and CutCount > 0.75  
7-Non-Straight/Horizontal…………. TaperRat < 0.60 or CurvRat  0.02 and CutPitch < 7  
8-NonStraight/Wedge………………. TaperRat < 0.60 or CurvRat  0.02 and 7º < CutPitch < 83º  
9-Non-Straight/Vertical ……………..TaperRat < 0.60 or CurvRat  0.02 and 83º < CutPitch < 112º  
10-Non-Straight/Single Serif……….. TaperRat < 0.60 or CurvRat  0.02 and CutCount 0.75  
11-Non-Straight/Double Serif ……….TaperRat < 0.60 or CurvRat  0.02 and CutCount > 0.75

### Notes

Diagonal arms of sans serif letterforms will often bow when the proportion of the glyphs becomes very condensed, causing this extremely rare attribute to change within a family.

Some fonts use a different topology for the uppercase A that resembles more of a inverted horseshoe than a triangle. These fonts should be classified as 1-No Fit for this category and may indicate a Decorative face. Check the family size and the availability of italics. If there are none go to [Section 4](http://monotype.de/services/pan4/).

## 2.8 Letterform

### Sub-digits

0-Any  
1-No Fit  
2-Normal/Contact  
3-Normal/Weighted  
4-Normal/Boxed  
5-Normal/Flattened  
6-Normal/Rounded  
7-Normal/Off Center  
8-Normal/Square  
9-Oblique/Contact  
10-Oblique/Weighted  
11-Oblique/Boxed  
12-Oblique/Flattened  
13-Oblique/Rounded  
14-Oblique/Off Center  
5-Oblique/Square

### Description

Most sophisticated typeface designs alter the roundness of the character shapes in order to give the font a distinctive appearance or balance of white-space. This roundness is classified in the Letterform category. In addition to the glyph roundness, the predominant skewing of the character forms is also recorded and used to isolate oblique characters.

### Measurements

The measurements that were used to determine the speed trait for the Stroke Variation digit are also used to determine the roundness component of the Letterform digit. Only the outer ellipse variables are used in this category.

OutRad  
OutRad([Figure 7](http://monotype.de/services/pan2" \l "Fig7UpperO)), or the outer radius, is a horizontal measurement taken on the uppercase O, from the center of the glyph to the right-most extent of the glyph shape.

OutMid  
There are several steps involved in determining the OutMid([Figure 7](http://monotype.de/services/pan2" \l "Fig7UpperO)) measurement. The upper right corner of the uppercase O is used to determine the OutMid. The OutMid is a horizontal measurement that extends from the middle of the character to the character edge. Unlike the OutRad, the vertical placement of this measurement is not at the mid point of the glyph, but rather at a point specified by the intersection of a diagonal bisecting line referred to as the Inter-edge line.

The Inter-edge line is drawn from the glyph center to the intersection of two lines, one horizontal and one vertical, that indicate the vertical location of the upper extent of the character and the horizontal location of the right-most extent of the character. On a perfect circle, the resulting Inter-edge line is at a 45º angle.

With the Inter-edge line correctly drawn, the OutMid can be determined. It is a horizontal measurement taken from the horizontal mid point of the glyph to the point where the Inter-edge line intersects the outer edge of the glyph shape.

In non-upright characters, all vertical lines for measuring distances are skewed to match the oblique angle.

These two variables, OutRad and OutMid, are used to determine the curvature of the outer ellipse of the uppercase O glyph. These same measurements will be used later in the Letterform category to assign an overall character roundness value to a given font. To determine the speed of stoke transition, the curvature of the inner ellipse of the uppercase O must also be determined. The same process described above is repeated for the inside of the uppercase O glyph with InRad and InMid.

OTall  
OTall([Figure 7](http://monotype.de/services/pan2" \l "Fig7UpperO)) measures the height of the uppercase letter O. It is a vertical measurement from the outside edge of the stroke at the top-most extent to the outside edge of the stroke at the bottom-most extent of the glyph.

CentDist  
The CentDist variable is needed to classify those designs that place the visual center of the fully round letterforms off true center. This measurement is taken by measuring the vertical distance from the baseline to the point at which the edge of the glyph reaches the right-most extent of the letterform. The line that defines the right-most extent must be skewed to match the character slant for this measurement.

Slant  
The slant([Figure 2](http://monotype.de/services/pan2" \l "Fig2UpperH)) determines whether a typeface is normal and upright or oblique in design. The Uppercase H is used to measure the angle of the glyph and is taken between the outside angle of the theoretical edge of the left leg and the baseline. This value is then subtracted from 90 to arrive at the Slant variable.

### Calculated Variables

OutCurv = OutMid / OutRad  
CentProp = CentDist / OTall

### Analysis

Because two traits are being handled in this classification category, two separate classification processes are conducted. First the slant of the glyph is evaluated to isolate the oblique font designs. Next, the curvature of the rounded characters is determined by using the OutCurv variable

Obliques are isolated by evaluating the Slant variable. If it is less than 85º, the glyph is considered Oblique.

The following two steps classify the roundness of the letterform:

1. Check for off-center glyphs. If the widest horizontal point of the uppercase O is more or less than 6% from the physical center of the glyph, the face is classified as Off Center. Hence, if CentProp is greater than 0.56 or less than 0.44 then the Off Center attribute is assigned.

2. If the font is not classified as Off Center, the OutCurv value is fit into the following list:

Contact = ……………OutCurv < 0.74  
Weighted =…..0.74 OutCurv 0.77  
Boxed =……. 0.77 < OutCurv 0.80  
Flattened =…. 0.80 < OutCurv 0.83  
Rounded =…. 0.83 < OutCurv 0.95  
Square =……. 0.95 < OutCurv

### Classification

0-Any  
1-No Fit  
2-Normal/Contact ………Slant 85 and OutCurv < 0.74 and 0.44 CentProp 0.56  
3-Normal/Weighted ……..Slant 85 and 0.74 OutCurv 0.77 and 0.44 CentProp 0.56  
4-Normal/Boxed …………Slant 85 and 0.77 < OutCurv 0.80 and 0.44 CentProp 0.56  
5-Normal/Flattened ………Slant 85 and 0.80 < OutCurv 0.83 and 0.44 CentProp 0.56  
6-Normal/Rounded……… Slant 85 and 0.83 < OutCurv 0.95 and 0.44 CentProp 0.56  
7-Normal/Off Center……. Slant 85 and 0.44 > CentProp > 0.56  
8-Normal/Square …………Slant 85 and OutCurv < 0.95 and 0.44 CentProp .056  
9-Oblique/Contact………. Slant < 85 and OutCurv< 0.74 and 0.44 CentProp 0.56  
10-Oblique/Weighted……. Slant < 85 and 0.74 < OutCurv0.77 and 0.44 CentProp 0.56  
11-Oblique/Boxed……….. Slant < 85 and 0.77 <OutCurv 0.80 and 0.44 CentProp 0.56  
12-Oblique/Flattened …….Slant < 85 and 0.80 <OutCurv 0.83 and 0.44 CentProp 0.5  
13-Oblique/Rounded…….. Slant < 85 and 0.83 < OutCurv0.95 and 0.44 CentProp 0.56  
14-Oblique/Off Center…… Slant < 85 and 0.44 >CentProp > 0.56  
15-Oblique/Square ……….Slant < 85 and OutCurv< 0.95 and 0.44 CentProp 0.56

### Notes

Oblique is a general classification that is intended to catch most italic letterforms and all oblique variants of sans serif faces. There are cases where a Roman face will classify as an oblique due to the amount of character skew that is incorporated in the design. The Oblique setting should not be assigned due to knowledge of the intent of the face, but rather strictly on the visual trait of glyph skewing. In the rare case where both the Roman and Italic components of a font family classify as italic you can override the classification recommendation given for the Roman.

The roundness of a character as stated above is a very subtle detail that determines a great deal about a given fonts appearance. Due to the subtle nature of this measurement and its classification parameters, you can expect some families to break across different roundness values from the roman to the italic face.

## 2.9 Midline

### Sub-digits

0-Any  
1-No Fit  
2-Standard/Trimmed  
3-Standard/Pointed  
4-Standard/Serifed  
5-High/Trimmed  
6-High/Pointed  
7-High/Serifed  
8-Constant/Trimmed  
9-Constant/Pointed  
10-Constant/Serifed  
11-Low/Trimmed  
12-Low/Pointed  
13-Low/Serifed

### Description

The ninth category in the PANOSE classification system analyzes two traits, the placement of the midline across the uppercase characters and the treatment of diagonal stem apexes. The midline classification falls into one of four sub-categories: Standard, High, Constant, and Low. The apex treatment has only three variants: Trimmed, Pointed, and Serifed.

### Measurements

MidE  
The MidE([Figure 5](http://monotype.de/services/pan2" \l "Fig5UpperE)) variable specifies the distance of the center of the middle horizontal arm of the uppercase E from the baseline. This measurement is strictly vertical and is not changed for non-upright letterforms. If necessary, the measurement is also taken from the midpoint on the stem to avoid curvature or stem slanting that may be incorporated into the font’s design.

CapH  
CapH([Figure 2](http://monotype.de/services/pan2" \l "Fig2UpperH)) is the cap height and it is measured on the uppercase H, from the top-most Y-extent to the bottom-most Y-extent along the theoretical midline of the left vertical stroke. The midline is chosen to avoid serifs that extend the height or depth of the character shape. This is a vertical measurement regardless of whether the character is italic or oblique.

MidA  
Like the MidE, MidA([Figure 10](http://monotype.de/services/pan2" \l "Fig10AMeasures)) represents the distance from the center of the horizontal arm of the uppercase A to the baseline. To accommodate for extravagant letterforms, this measurement is taken at the horizontal midpoint of the glyph. Again, this is a vertical measurement and is not altered for italic characters.

ACap  
The ACap([Figure 10](http://monotype.de/services/pan2" \l "Fig10AMeasures)) variable measures the amount of flatness at the apex of the uppercase A. Most often, this is a simple horizontal measurement taken at the upper extent of the letterform. In more sophisticated designs, it may be necessary to take this measurement at an angle along a theoretical edge for the upper apex. It is common to have a font design that contains no flatness at the apex of the uppercase A glyph, or where the apex is highly rounded. In these cases, zero flatness is assigned. Note: If the top of the A is serifed, project the theoretical edges of the right and left stems through the serif, and measure the distance between them.

CapPitch  
Many uppercase A glyph designs allow the right arm to project through the left arm at the apex of the letterform. Subsequently, that projected stem is then cut back to lessen its visual prominence. The angle at which the stem is cut back is recorded in the CapPitch variable which is determined by measuring the angle of the theoretical tip of the uppercase A. This measurement ([Figure 10](http://monotype.de/services/pan2#Fig10AMeasures)) will generally be between 0 and 90 degrees, and should be taken on any design where the upper extent of the right diagonal arm creates a surface that is not a rounding point for the apex.

ASerL ASerR  
This variable is a point-count variable similar to the CutCount field specified in the Arm Style digit. In this case the corners, rounded or square, of the left and right sides of the apex of the uppercase A are counted. A count of 1 is always entered for the single corner at the apex. For example, If the apex forms a clean point, both ASerL and ASerR ([Figure 10](http://monotype.de/services/pan2#Fig10AMeasures)) equal one.

WStem(E)  
The E stem weight WStem(E) ([Figure 5](http://monotype.de/services/pan2#Fig5UpperE)) is measured horizontally at the x-height of the uppercase E, half way between the upper two arms. This measurement is the width of the vertical stem, or back bone, of the character. This measurement is to be taken perpendicular to the stem. In the case of an oblique letter, the horizontal axis is positioned perpendicular to the stem. Note: for the purpose of serif designs, this measurement is applied to the large (400 point) uppercase I glyph.

### Calculated Variables

EArm = MidE / CapH  
AArm = MidA / CapH  
ArmDif = EArm - Aarm  
TrimRat = ACap / WStem(E)  
ASer = (ASerL + ASerR) / 2

### Classification

The classification of the midline digit requires two separate sub-classifications. First the setting for the midline placement is assigned, followed by the setting for the apex treatment. The combination of these attributes form the Midline digit for PANOSE.

To determine the midline setting, first the constant midlines are isolated by evaluating the ArmDif variable. If the ArmDif is less than 0.08, then the placement of the arms is considered similar and the font is classified as having a Constant midline. If the value of the ArmDif is greater than or equal to 0.08, then the location of the midline on the uppercase E is further evaluated to determine the correct setting. If the EArm value is greater than 0.58, the font is classified with a High midline position. If the EArm is less than 0.45 then the font is classified with a Low midline position. The remaining fonts are classified with a Standard midline setting.

To classify the apex treatment, the fonts with complex serifs at the apex the uppercase A are isolated. This is done by evaluating the ASer variable. If ASer is greater than 2, the font is classified as having a Serif apex. If ASer is less than or equal to 2, the apex is evaluated for flatness. This is done by evaluating the TrimRat variable. If TrimRat is greater than or equal to 0.6 then the font is classified as Trimmed. If the font has a TrimRat variable that is less than 0.6, the font is classified as Pointed. If the uppercase A glyph uses a non-triangular topology (i.e., semi-circular), then evaluate the middle apex on the uppercase M glyph. If it is rounded, the face classifies as trimmed.

0-Any  
1-No Fit  
2-Standard (ArmDif  0.08, and 0.45 EArm 0.58),  
…Trimmed (ASer 2, and TrimRat  0.6)  
3-Standard (ArmDif  0.08, and 0.45 EArm 0.58),  
…Pointed (ASer 2, and TrimRat  0.6)  
4-Standard (ArmDif  0.08, and 0.45 EArm 0.58),  
…Serifed (ASer > 2)  
5-High (ArmDif  0.08, and EArm > 0.58),  
…Trimmed (ASer 2, and TrimRat  0.6)  
6-High (ArmDif  0.08, and EArm > 0.58)  
…Pointed (ASer 2, and TrimRat < 0.6)  
7-High (ArmDif  0.08, and EArm > .058),  
...Serifed (ASer > 2)  
8-Constant (ArmDif < 0.08)  
…Trimmed (ASer 2, and TrimRat  0.6)  
9-Constant (ArmDif < 0.08)  
…Pointed (ASer 2, and TrimRat < 0.6)  
10-Constant (ArmDif < 0.08)  
…Serifed (ASer > 2)  
11-Low (ArmDif  0.08, and EArm < 0.45),  
…Trimmed (ASer 2, and TrimRat  0.6)  
12-Low (ArmDif  0.08, and EArm < 0.45),  
…Pointed (ASer 2, and TrimRat < 0.6)  
13-Low (ArmDif  0.08, and EArm < 0.45),  
…Serifed (ASer > 2)

### Notes

If a midline is classified as Constant, there is no indication of the height of the midline. This is correct. In most cases, the midline is standard or high, but there will be cases where the midline may be very low and constant. These low, constant midlines are correctly classified as Constant.

A medium weight font with a Constant midline usually shifts its midline to Standard when additional weight is applied to the letter.

The apex of many uppercase A glyphs occurs above the capline. It should not be assumed that the capline provides a basis for the apex flatness (ACap) measurement.

## 2.10 X-height

### Sub-digits

0-Any  
1-No Fit  
2-Constant/Small  
3-Constant/Standard  
4-Constant/Large  
5-Ducking/Small  
6-Ducking/Standard  
7-Ducking/Large

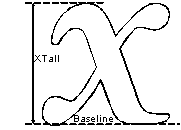
### Description

Two different traits are represented in the X-height digit: the treatment of uppercase glyphs with diacritical marks and the relative size of the lowercase characters. The classification of these traits are simple and straightforward. Note: If a face does not have lowercase glyphs, it is a Decorative. See Section 4 for these classification rules.

### Measurements

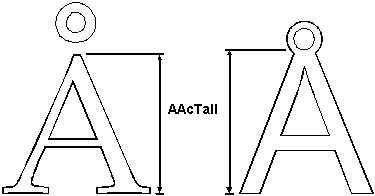
Two measurements are used for calculating the X-height. The height of the uppercase glyph for the typeface has already been measured in the Serif Style digit by means of the CapH variable. The lowercase height is measured as described in XTall. Similarly, the uppercase is evaluated to determine how the glyph height is altered to account for diacritical marks.

**Figure 13 - Lower X**



Xtall  
XTall([Figure 13](http://monotype.de/services/pan2" \l "Fig13LowerX)) is the measurement of the lowercase characters from the baseline vertically to the upper extent of the upper left stem of the lowercase x.

**Figure 14 - A Ring**



AAcTall  
The height of the ARing character, “Å” ([Figure 14](http://monotype.de/services/pan2#Fig14ARing)) is used to evaluate diacritical treatment. This is a vertical measurement and is taken from the baseline to the upper extent of the uppercase A portion of the ARing glyph. This measurement does not include the size of the ring. In the cases where the ring is joined to the uppercase A portion of the character, the measurement should be taken from the baseline to the lower extent of the inner white-space of the ring.

### Calculated Variables

DuckRat = AAcTall / CapH  
Rat = XTall / CapH

### Classification

If a typeface has been designed such that extra space is allotted in the Em square for diacritical marks, the uppercase glyphs will not have to be foreshortened when diacritical marks are applied. The DuckRat variable is used to indicate when a font is not designed for normal diacritical use and needs to duck the height of the uppercase letters.

If the DuckRat value is less than or equal to 0.93 the font design is considered to be a ducking design.

The XRat variable is used to determine the relative size of the lowercase. The table below is used to classify fonts based on the XRat.

Small = XRat 0.50  
Medium = 0.50 < XRat 0.66  
Large = 0.66 < XRat

### Notes

As more fonts are designed for international markets, the occurrence of Ducking font designs will subside. The reason for including a classification of ducking versus non-ducking fonts is that the visual height of the font is greatly effected by this treatment. Fonts that have been designed to include diacritical marks have an overall smaller visual height than fonts that utilize the entire space above the baseline for uppercase characters.

More and more, fonts are being designed and re-cut with larger x-heights. It is increasingly uncommon to classify a new font with an x-height that is less than 66% of the uppercase.

While the original PANOSE System included classification isolation of fonts which include no lowercase, this version of the PANOSE Typeface Matching System has moved such faces to the Latin Decorative family ([Section 4](http://monotype.de/services/pan4/)).

# 3.0 Latin Hand Written

## 3.1 Family Kind

### Sub-digits

0-Any  
1-No Fit  
2-Latin Text  
**3-Latin Hand Written**  
4-Latin Decorative  
5-Latin Symbol

### Description

Many fonts are clearly scripts and unrelated to any book face. On occasion, though, the distinction gets rather vague. A good rule of thumb is that if the cursive font is part a family that includes a book face, then it should be classified in the Latin Text group. If it is freestanding with no obvious related book face, then it falls into the Latin Hand Written group. This can be a bit difficult to determine, since a font house may only choose to provide the cursive from a larger family, so the classifier needs to think about the face being processed and not do it purely by rote.

## 3.2 Tool kind

### Sub-digits

0-Any  
1-No Fit  
2-Flat Nib  
3-Pressure Point  
4-Engraved  
5-Ball (Round Cap)  
6-Brush  
7-Rough  
8-Felt Pen/Brush Tip  
9-Wild Brush - Drips a lot

### Description

Kind of implement predominately used to create character forms. A **flat nib** is an inflexible rectangular nib, like a standard calligraphy pen nib, whose line width is dependent only on the angle of the edge of the nib with respect to the line. A **pressure point** is a flexible point, like those used to do copperplate lettering, which spreads when pressed down upon and forms a wider line. **Engraved** cursive lettering has many of the characteristics of pressure point, but it also has fine added lines that could only be made with a graver. **Ball** is the type of line produced by a ball point pen or similar round nib. It has a single line weight and convexly rounded stem caps. **Brush** means a rectangular brush. It looks superficially like a flat nib but has more fluid stroke endings and gentle swellings along strokes as a brush would make responding to pressure. **Rough** looks like the lettering was done with a rough edged nib or a nib that was too dry or on a rough surface. It is characterized by unpredictable starts and stops within the letter.**Felt tip** or **brush tip** looks somewhat like the Ball nib but has the characteristic swellings within the line of a more flexible instrument. **Wild brush** looks hastily or sloppily done with drips and splatters of ink in unpredictable places. The difference between this and a decorative lettering is often minimal and based on readability and whether there is a full family of letter forms (book, italic, bold, and bold italic).

### Examples

**Figure 15 - Hand Written Tool Kinds**



**2 - Flat Nib**



**3 - Pressure Point**



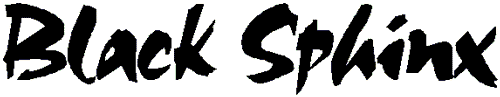
**4 - Engraved**



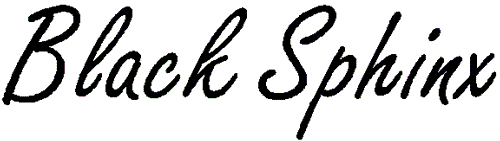
**5 - Ball**



**6 - Brush**



**7 - Rough**



**8 - Felt Tip / Brush Tip**



**9 - Wild Brush**

## 3.3 Weight

### Sub-digits

0-Any  
1-No Fit  
2-Very Light  
3-Light  
4-Thin  
5-Book  
6-Medium  
7-Demi  
8-Bold  
9-Heavy  
10-Black  
11-Extra Black (Nord)

Description

The Weight digit classifies the appearance of a font’s stroke thickness in relation to its height. This is expressed as a ratio taken from two measurements on the uppercase E glyph. See [Section 2](http://monotype.de/services/pan2/).

### Measurements

Two measurements are required for classification of the Weight digit.

CapH  
CapH ([Figure 2](http://monotype.de/services/pan2/#Fig2UpperH))is the cap height and is measured on the uppercase H, from the top-most Y-extent to the bottom-most Y-extent at the theoretical midline of the left vertical stroke. The midline is chosen to avoid serifs that extend the height or depth of the character shape. This is a vertical measurement even if the glyph is italic or oblique.

WStem(E)  
The width of the vertical stem, WStem(E) ([Figure 5](http://monotype.de/services/pan2/#Fig5UpperE)), is measured horizontally on the uppercase E at a point halfway between the upper two arms. This measurement is the width of the vertical stem, or back bone, of the character and is taken perpendicular to the stem. In the case of an oblique letter, the horizontal axis is shifted to be perpendicular to the stem. Note: For the purpose of serif designs, this measurement is applied to the large (400 point) uppercase I glyph.

### Calculated Variables

Only one calculated variable (WeightRat) is used to determine the Weight digit for the PANOSE Typeface Matching System. The WeightRat variable is calculated by dividing the cap height by the width of the vertical stem.

WeightRat = CapH / WStem(E)

### Classification

To determine the exact PANOSE Weight digit, round the WeightRat value to two decimal places and match it in the following table:

0-Any  
1-No fit  
2-Very Light….……WeightRat 35  
3-Light……….18  WeightRat  35  
4-Thin……….10  WeightRat  18  
5-Book………7.5  WeightRat  10  
6-Medium……5.5 WeightRat  7.5  
7-Demi………4.5 WeightRat  5.5  
8-Bold……….3.5 WeightRat  4.5  
9-Heavy……..2.5 WeightRat  3.5  
10-Black……..2.0 WeightRat  2.5  
11-Extra Black…….WeightRat 2.0

### Notes

The tolerances of the weight classification have been determined by testing a variety of fonts. While this has provided reasonable averages for the ranges of weights, these will not always directly correspond with a font’s external name. It is not uncommon to have a font that contains the word "Bold" in the name that actually classifies as 7-Demibold.

In addition, certain families that have a surplus of font weights may not progress smoothly through the differing classification options. It is, however, rare that two fonts within the same family will have two weights that exist in the same classification category. Notify Hewlett-Packard of any cases where this occurs.

Caution on measurements: When measuring a design with a highly rounded or bowed inside stem, be certain to calculate the correct theoretical edge for the location of the stem edge. Curved stems can alter the measurements for classification significantly enough to alter the resulting category.

## 3.4 Spacing

### Sub-digits

0-Any  
1-No fit  
2-Proportional Spaced  
3-Monospaced

### Description

This digit allows monospaced and proportional fonts to be distinguished.

## 3.5 Aspect Ratio

### Sub-digits

0-Any  
1-No Fit  
2-Very Condensed  
3-Condensed  
4-Normal  
5-Expanded  
6-Very Expanded

### Description

This is the ratio between the width and the height of the face measured using the Upper O([Figure 7](http://monotype.de/services/pan2/" \l "Fig7UpperO))

### Measurements

OWid  
The OWid([Figure 7](http://monotype.de/services/pan2/" \l "Fig7UpperO)) horizontal measurement reflects the general width of the uppercase O glyph. It is measured from the left-most extent of the left side of the stroke, to the right-most extent of the right side of the stroke.

OTall  
OTall([Figure 7](http://monotype.de/services/pan2/" \l "Fig7UpperO)) depicts the height of the uppercase O glyph. It is a vertical measurement from the outside edge of the stroke at the top-most extent to the outside edge of the stroke at the bottom-most extent of the glyph. Skewed, italic, or oblique characters should not skew this measurement. It should remain strictly vertical.

### Calculated Variable

**ORat = OTall / OWid**

### Classification

0-Any  
1-No Fit  
2-Very Condensed………….ORat  2.1  
3-Condensed ….…….1.27 ORat 2.1  
4-Normal …….……..0.92 ORat  1.27  
5-Expanded…….….. 0.90 ORat  0.92  
6-Very Expanded ………….ORat  0.90

## 3.6 Contrast

### Sub-digits

0-Any  
1-No Fit  
2-None  
3-Very Low  
4-Low  
5-Medium Low  
6-Medium  
7-Medium High  
8-High  
9-Very High

### Description

The Contrast digit describes the ratio between the thickest point on the letter O and the narrowest point on the letter O. This ratio is called the ConRat and involves two relatively straight forward measurements.

The glyph shape of the uppercase O is used to calculate the contrast digit because it is generally of higher contrast than the other characters of the alphabet. For instance, the thick segments of the uppercase O are wider than the thick segments of other letters of the alphabet. This emphasis on contrast with the rounded character shapes is used because it emphasizes the contrast of the character shape, thus giving greater separation of visual traits in classification. The ratio of narrow to wide is used for contrast because it defines the degree of variation in the letterform as it changes from thick to thin.

This measurement should not be confused with the sixth PANOSE digit, Stroke Variation. Stroke variation classifies the transition process between the thick and thin segments of the uppercase O, the relative values themselves.

### Measurements

The contrast digit is calculated using two measurements, WideO() and NarO. These two measurements are often quite simple to determine. With advanced or calligraphic character shapes determining the location where the stem is at its maximum or minimum width is often more challenging. For this reason, it is recommended that a large sample is used to calculate the Contrast digit.

WideO  
WideO ([Figure 7](http://monotype.de/services/pan2/#Fig7UpperO)) variable is assigned by measuring the stem of the uppercase O glyph where it is thickest. Often this will be at the right or left-most extent of the letter-form, measured in a horizontal line.

NarO  
Similar to WideO, NarO ([Figure 7](http://monotype.de/services/pan2/#Fig7UpperO)) is assigned by measuring the narrowest point of the uppercase O glyph, usually the top most extent of the letter-form and, in this case, is measured vertically.

If diagonal stress has been applied to the shape of the uppercase O glyph the points of highest contrast may not occur at the top and bottom or furthest left and right extent of the glyph. In this case, WideO and NarO are the positions on the glyph where the difference between the inside and outside radials has the maximum and minimum value respectively.

The rule for determining the radials for the purpose of this classification method is that they must cross the outer edge of the glyph perpendicular to a line that is tangent to the stroke. The radials can usually be determined by locating the character center and drawing a line straight out through the glyph. Yet, in some exaggerated letterforms, specifically flattened, rounded, or off-center glyph shapes, a center-based radial will not provide a measurement that is perpendicular to the stroke. In these complex character shapes, the WideO and NarO must be measured using the radial differences method mentioned in the previous paragraph.

### Calculated Variables

ConRat  
ConRat = NarO / WideO  
If the ConRat variable is greater than one, there is horizontal stress on the letter; Transpose the calculation and recalculate it (i.e., ConRat = WideO/NarO).

### Classification

To determine the exact PANOSE digit for contrast, fit the contrast ratio (ConRat) into the following table:

0-Any  
1-No Fit  
2-None……………..0.80 ConRat  
3-Very Low………..0.65 ConRat  0.80  
4-Low………………0.48 ConRat  0.65  
5-Medium Low…….0.30 ConRat  0.48  
6-Medium………….0.20 ConRat  0.30  
7-Medium High…… 0.15 ConRat  0.20  
8-High…………….. 0.08 ConRat  0.15  
9-Very High ………………ConRat 0.08

## 3.7 Topology

### Sub-digits

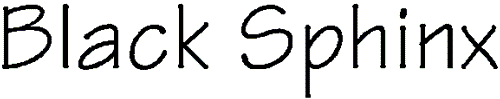
0-Any  
1-No Fit  
2-Roman Disconnected  
3-Roman Trailing  
4-Roman Connected  
5-Cursive Disconnected  
6-Cursive Trailing  
7-Cursive Connected  
8-Blackletter Disconnected  
9-Blackletter Trailing  
10-Blackletter Connected

### Description

The topology classification is a two step process. First the cursive face is separated into Roman, Cursive, and Blackletter based on the letterforms and then the connections between the letters are classified.**Roman**means that the letterforms are still similar to upright faces, but have been slanted to from a cursive. These faces tend to look like hand printing. **Cursive** means that some characters, such as the lower a and g, have been modified to look more like hand written forms. These faces tend to look like flowing script handwriting. **Blackletter** implies that there have been major modifications to many of the letterforms. These faces tend to be very black and condensed and often feel angry or aggressive.**Disconnected** means that each letter is distinct and there is no connection from one to the next.**Trailing**means that the trailing serifs of the letters, usually along the baseline, have been extended so that they may overlap with the following character. **Connected** means that the letterforms have been constructed so that they connect to their neighbors explicitly.

### Examples

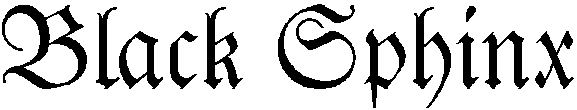
**Figure 16 - Hand Written Styles**



**Roman**

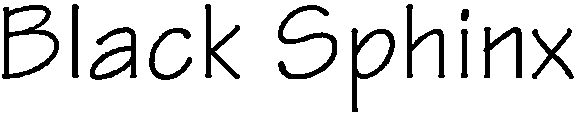


**Cursive**



**Blackletter**

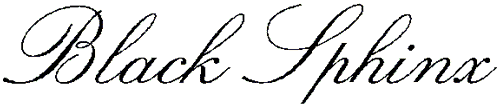
**Figure 17 - Connections**



**Disconnected**



**Trailing**



**Connected**

## 3.8 Form

### Sub-digits

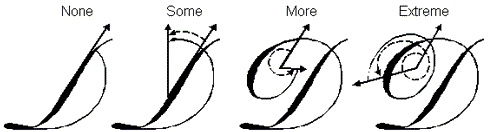
0-Any  
1-No Fit  
2-Upright / No Wrapping  
3-Upright / Some Wrapping  
4-Upright / More Wrapping  
5-Upright / Extreme Wrapping  
6-Oblique / No Wrapping  
7-Oblique / Some Wrapping  
8-Oblique / More Wrapping  
9-Oblique / Extreme Wrapping  
10-Exaggerated / No Wrapping  
11-Exaggerated / Some Wrapping  
12-Exaggerated / More Wrapping  
13-Exaggerated / Extreme Wrapping

### Description

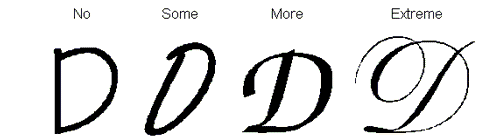
The form digit tries to measure the general look of the face. It combines two measures, the slope of the verticals and the wrap of the tails of connecting strokes, such as the curving stroke in the Upper D.

### Example

**Figure 18 - Wrapping Measure**



**Figure 19 - Wrapping**



### Measurements

Slant  
The slant ([Figure 2](http://monotype.de/services/pan2/#Fig2UpperH)) is measured up the center of the Upper H left vertical stem, with respect to the Baseline.

Wrap  
The wrap is measured on the Upper D where the bowed stem meets the vertical stem.

### Classification

0º  Slant  5º……. Upright  
5º Slant  15º……Oblique  
15º Slant………..Exaggerated

Curving D stem meets vertical stem………………………………….…………No Wrapping  
Curving D stem passes vertical stem but does not curve more than 90º….Some Wrapping  
Curving D stem passes vertical stem but curves less than 360º…………..More Wrapping  
Curving D stem passes vertical stem but curves more than 360º…………Extreme Wrapping

## 3.9 Finials

### Sub-digits

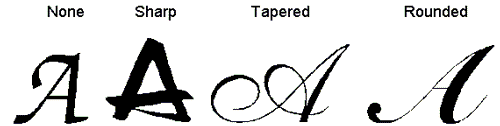
0-Any  
1-No Fit  
2-None / No loops  
3-None / Closed loops  
4-None / Open loops  
5-Sharp / No loops  
6-Sharp / Closed loops  
7-Sharp / Open loops  
8-Tapered / No loops  
9-Tapered / Closed loops  
10-Tapered / Open loops  
11-Round / No loops  
12-Round / Closed loops  
13-Round / Open loops

### Description

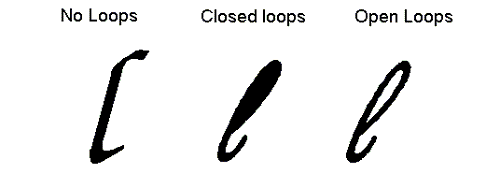
Finials combines the treatment of the ends of characters, like the foot at the right bottom of the upper a, with the treatment of the ascenders of the lower case characters. If there is no extra treatment of the stroke end, other than what the lettering nib would naturally do, that is a **none**. If has been chopped off abruptly, that is a **sharp**, if it has been tapered to a narrower width than the nib would naturally create, that is a **tapered**. If it has been made bulbous that is **rounded**. The classification of ascenders into no loops, open loops and closed loops is usually unambiguous.

### Examples

**Figure 20 - Finials**



**Figure 21 - Ascenders**



## 3.10 X-Ascent

### Sub-digits

0-Any  
1-No Fit  
2-Very Low  
3-Low  
4-Medium  
5-High  
6-Very High

### Description

The X-ascent digit measures the relative size of the lowercase characters.

### Measurements

Two measurements are used for calculating the X-height. The height of the uppercase glyph for the typeface has already been measured in the Serif Style digit by means of the CapH variable. The lowercase height is measured as described in XTall. Similarly, the uppercase is evaluated to determine how the glyph height is altered to account for diacritical marks.

XTall  
XTall ([Figure 13](http://monotype.de/services/pan2/#Fig13LowerX))is the measurement of the lowercase characters from the baseline vertically to the upper extent of the upper left stem of the lowercase x.

CapH  
CapH([Figure 2](http://monotype.de/services/pan2/" \l "Fig2UpperH)) is the cap height and it is measured on the uppercase H, from the top-most Y-extent to the bottom-most Y-extent along the theoretical midline of the left vertical stroke. The midline is chosen to avoid serifs that extend the height or depth of the character shape. This is a vertical measurement regardless of whether the character is italic or oblique.

### Calculated Variables

XRat = XTall / CapH

### Classification

The XRat variable is used to determine the relative size of the lowercase. The table below is used to classify fonts based on the XRat.

Very Low ……………XRat  0.40  
Low…………….0.4 XRat 0.50  
Medium.………0.50 XRat 0.66  
High……………0.66 < XRat 0.75  
Very High………0.75 XRat

# 4.0 Latin Decorative

## 4.1 Family Kind

### Sub-digits

0-Any  
1-No Fit  
2-Latin Text  
3-Latin Hand Written  
**4-Latin Decorative**  
5-Latin Symbol

### Description

Latin Decorative faces are those that are designed more for impact than readability. Usually Decoratives are used singly or in small groups, for special purposes. Small cap fonts are also included in this group because they have become unusual enough to be considered special purpose fonts.

## 4.2 Class

### Sub-digits

0-Any  
1-No Fit  
2-Derivative  
3-Non-standard Topology  
4-Non-standard Elements  
5- Non-standard Aspect  
6-Initials  
7-Cartoon  
8-Picture Stems  
9-Ornamented  
10-Text and Background  
11-Collage  
12-Montage

### Description

The class is the general look and feel of the face. Faces should be classed with as low a digit as is reasonable. **Derivative** is Decoratives that are closely derived standard text forms. **Non-standard Topology** has unusual forms for entire letters but still uses standard stems. **Non-standard Elements** has usual forms but unusual treatments of parts of them, such as serifs or ascenders.**Non-standard Aspect**has the usual letter forms but unusual proportions such as very high or very low waists. **Initials**is for faces that only have majuscule characters, no minuscules. Often these characters are highly ornamented.**Cartoon** faces have the entire letter made up of a single picture that form the outline of the character.**Picture Stem** faces have each stem made up of a picture or pictures and the letters made from groups of these elements. **Ornamented** faces have additional flourishes and details added to the character. **Text and Background** faces have the characters displayed as the absence of pattern on a patterned background. In **Collage** faces the characters are made up of repeating nonstandard elements. In **Montage**faces the characters are made up of nonrepeating nonstandard elements.

### Examples

**Figure 22 - Decorative Classes**



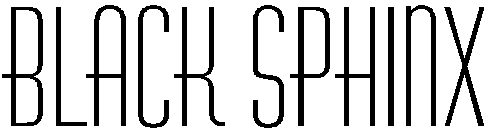
**2 - Derivative**

Panose font example

**3 - Non-standard Topology**



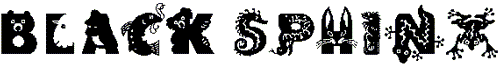
**4 - Non-standard Elements**



**5 - Non-standard Aspect**

Panose font example

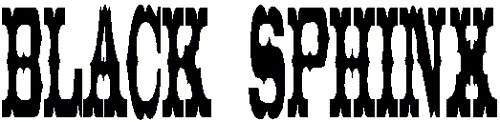
**6 - Initials**



**7 - Cartoon**

Panose font example

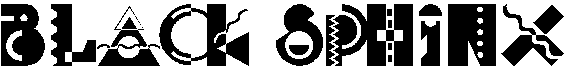
**8 - Picture Stems**



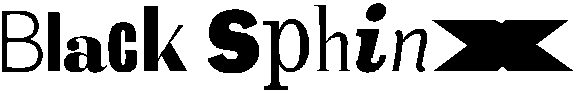
**9 - Ornamented**

Panose font example

**10 - Text and Background**



**11 - Collage**



**12 - Montage**

## 4.3 Weight

### Sub-digits

0-Any  
1-No Fit  
2-Very Light  
3-Light  
4-Thin  
5-Book  
6-Medium  
7-Demi  
8-Bold  
9-Heavy  
10-Black  
11-Extra Black

### Description

The Weight digit classifies the appearance of a fonts’ stroke thickness in relation to its height. This is expressed as a ratio taken from two measurements on the uppercase E glyph.

### Measurements

Two measurements are required for classification of the Weight digit.

CapH  
CapH ([Figure 2](http://monotype.de/services/pan2/#Fig2UpperH)) is the cap height and is measured on the uppercase H, from the top-most Y-extent to the bottom-most Y-extent at the theoretical midline of the left vertical stroke. The midline is chosen to avoid serifs that extend the height or depth of the character shape. This is a vertical measurement even if the glyph is italic or oblique.

WStem(E)  
The width of the vertical stem, WStem(E) ([Figure 5](http://monotype.de/services/pan2/#Fig5UpperE)), is measured horizontally on the uppercase E at a point halfway between the upper two arms. This measurement is the width of the vertical stem, or back bone, of the character and is taken perpendicular to the stem. In the case of an oblique letter, the horizontal axis is shifted to be perpendicular to the stem. Note: For the purpose of serif designs, this measurement is applied to the large (400 point) uppercase I glyph.

### Calculated Variables

Only one calculated variable (WeightRat) is used to determine the Weight digit for the PANOSE Typeface Matching System. The WeightRat variable is calculated by dividing the cap height by the width of the vertical stem.

WeightRat = CapH / WStem(E)

### Classification

To determine the exact PANOSE Weight digit, round the WeightRat value to two decimal places and match it in the following table:

0-Any  
1-No fit  
2- Very Light………………WeightRat  35  
3-Light……………….18 WeightRat  35  
4-Thin………………..10 WeightRat  18  
5-Book……………….7.5 WeightRat  10  
6-Medium……………5.5 WeightRat  7.5  
7-Demi……………….4.5 WeightRat  5.5  
8-Bold……………….3.5 WeightRat  4.5  
9-Heavy……………..2.5 WeightRat  3.5  
10-Black……………..2.0 WeightRat  2.5  
11-Extra Black……………..WeightRat  2.0

Notes

The tolerances of the weight classification have been determined by testing a variety of fonts. While this has provided reasonable averages for the ranges of weights, these will not always directly correspond with a font’s external name. It is not uncommon to have a font that contains the word “Bold” in the name that actually classifies as 7-Demibold.

In addition, certain families that have a surplus of font weights may not progress smoothly through the differing classification options. It is, however, rare that two fonts within the same family will have two weights that exist in the same classification category. Notify Hewlett-Packard of any cases where this occurs.

Caution on measurements: When measuring a design with a highly rounded or bowed inside stem, be certain to calculate the correct theoretical edge for the location of the stem edge. Curved stems can alter the measurements for classification significantly enough to alter the resulting category. Very ragged or highly ornamented stems can also throw this measure off. In such cases, try to pick an “average” width by looking at the face.

## 4.4 Aspect

### Sub-digits

0-Any  
1-No fit  
2-Super Condensed  
3-Very Condensed  
4-Condensed  
5-Normal  
6-Extended  
7-Very Extended  
8-Super Extended  
9-Monospaced

### Description

This is the ratio between the width and the height of the face.

### Measurements

OWid  
OWid ([Figure 7](http://monotype.de/services/pan2/#Fig7UpperO)) horizontal measurement reflects the general width of the uppercase O glyph. It is measured from the left-most extent of the left side of the stroke, to the right-most extent of the right side of the stroke.

OTall  
OTall ([Figure 7](http://monotype.de/services/pan2/#Fig7UpperO)) depicts the height of the uppercase O glyph. It is a vertical measurement from the outside edge of the stroke at the top-most extent to the outside edge of the stroke at the bottom-most extent of the glyph. Skewed, italic, or oblique characters should not skew this measurement. It should remain strictly vertical.

### Calculated Variable

ORat = OTall / OWid

### Classification

0-Any  
1-No Fit  
2-Super Condensed ……….ORat 2.6  
3-Very Condensed…. 2.1  ORat  2.6  
4-Condensed……… 1.27  ORat  2.1  
5-Normal ………….0.92  ORat  1.27  
6-Extended……….. 0.90  ORat  0.92  
7-Very Extended…. 0.85  ORat  0.90  
8-Super Extended………… ORat  0.85

## 4.5 Contrast

### Sub-digits

0-Any  
1-No Fit  
2-None  
3-Very Low  
4-Low  
5-Medium Low  
6-Medium  
7-Medium High  
8-High  
9-Very High  
10-Horizontal Low  
11-Horizontal Medium  
12-Horizontal High  
13-Broken

### Description

The Contrast digit describes the ratio between the thickest point on the letter O and the narrowest point on the letter O. This ratio is called the ConRat and involves two relatively straight forward measurements.

The glyph shape of the uppercase O is used to calculate the contrast digit because it is generally of higher contrast than the other characters of the alphabet. For instance, the thick segments of the uppercase O are wider than the thick segments of other letters of the alphabet. This emphasis on contrast with the rounded character shapes is used because it emphasizes the contrast of the character shape, thus giving greater separation of visual traits in classification. The ratio of narrow to wide is used for contrast because it defines the degree of variation in the letterform as it changes from thick to thin.

This measurement should not be confused with the sixth PANOSE digit, Stroke Variation. Stroke variation classifies the transition process between the thick and thin segments of the uppercase O, the relative values themselves.

### Measurements

The contrast digit is calculated using two measurements, WideO and NarO([Figure 7](http://monotype.de/services/pan2/" \l "Fig7UpperO)). These two measurements are often quite simple to determine. With advanced or calligraphic character shapes determining the location where the stem is at its maximum or minimum width is often more challenging. For this reason, it is recommended that a large sample is used to calculate the Contrast digit.

WideO  
WideO ([Figure 7](http://monotype.de/services/pan2/#Fig7UpperO)) variable is assigned by measuring the stem of the uppercase O glyph where it is thickest. Often this will be at the right or left-most extent of the letter-form, measured in a horizontal line.

NarO  
Similar to WideO, NarO ([Figure 7](http://monotype.de/services/pan2/#Fig7UpperO)) is assigned by measuring the narrowest point of the uppercase O glyph, usually the top most extent of the letter-form and, in this case, is measured vertically.

If diagonal stress has been applied to the shape of the uppercase O glyph the points of highest contrast may not occur at the top and bottom or furthest left and right extent of the glyph. In this case, WideO and NarO are the positions on the glyph where the difference between the inside and outside radials has the maximum and minimum value respectively.

The rule for determining the radials for the purpose of this classification method is that they must cross the outer edge of the glyph perpendicular to a line that is tangent to the stroke. The radials can usually be determined by locating the character center and drawing a line straight out through the glyph. Yet, in some exaggerated letterforms, specifically flattened, rounded, or off-center glyph shapes, a center-based radial will not provide a measurement that is perpendicular to the stroke. In these complex character shapes, the WideO and NarO must be measured using the radial differences method mentioned in the previous paragraph.

### Calculated Variables

ConRat  
ConRat = NarO / WideO

If the ConRat variable is greater than one, there is horizontal stress on the letter; Transpose the calculation and recalculate it (i.e., ConRat = WideO/NarO).

### Classification

To determine the exact PANOSE digit for contrast, fit the contrast ratio (ConRat) into the following table:

1-No Fit  
2-None………………… 0.80 ConRat  
3-Very Low…………….0.65 ConRat 0.80  
4-Low …………………0.48 ConRat 0.65  
5-Medium Low ………..0.30 ConRat 0.48  
6-Medium…………….. 0.20 ConRat 0.30  
7-Medium High………..0.15 ConRat 0.20  
8-High …………………0.08 ConRat 0.15  
9-Very High………………….. ConRat 0.08

### Notes

Caution on measurements:. Very ragged or highly ornamented O stems can throw this measure off. In such cases, try to pick an “average” thick and thin width by looking at the face.

## 4.6 Serif Variant

### Sub-digits

0-Any  
1-No Fit  
2-Cove  
3-Obtuse Cove  
4-Square Cove  
5-Obtuse Square Cove  
6-Square  
7-Thin  
8-Oval  
9-Exaggerated  
10-Triangle  
11-Normal Sans  
12-Obtuse Sans  
13-Perpendicular Sans  
14-Flared  
15-Rounded  
16-Script

### Description

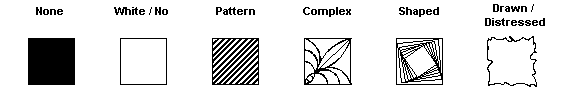
The most sophisticated digit in the PANOSE classification system is the Serif Style digit. This digit describes the appearance of the serifs used in a font design and groups them into one of fourteen general categories. See [**section 2.2**](http://monotype.de/services/pan2/#Sec2SerifStyle) for the details. This section follows that except that there is the addition of 16-Script which is used when the serif doesn’t fit any of the other categories. Because of the broad range of designs that have been created by typographers, a particular decorative face may not fit the strict [**section 2.2**](http://monotype.de/services/pan2/#Sec2SerifStyle) definitions. The classifier must then use judgment and experience to decide on the serif of a face.

## 4.7 Treatment

### Sub-digits

0-Any  
1-No Fit  
2-None - Standard Solid Fill  
3-White / No Fill  
4-Patterned Fill  
5-Complex Fill  
6-Shaped Fill  
7-Drawn / Distressed

**Figure 23 - Treatment Types**



### Description

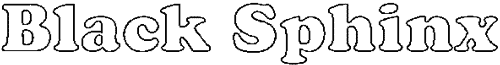
This digit describes the treatment of the total letters. For the sake of this digit it is assumed that the character actually consists of two parts, the outline and the fill within the outline. **None**is the standard solid fill that is used in text fonts. **White** or **No Fill** means that just the outline of the character shows.**Pattern** fill indicates that all the letters are filled with the same repeating pattern.**Complex** fill indicates that different letters are filled with different repeating patterns. **Shaped** fill indicates that the fill patterns are recognizable forms from other contexts. **Drawn** or **Distressed** fill indicates that the fill of each letter is unique and individual.

### Examples

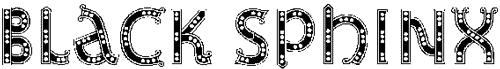
**Figure 24 - Treatment Examples**



**2 - Standard Solid Fill**



**3 - No Fill**



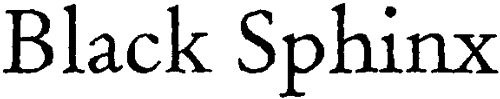
**4 - Patterned Fill**

Panose font example

**5 - Complex Fill**

Panose font example

**6 - Shaped Fill**



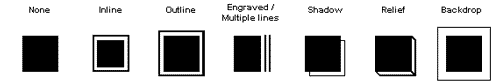
**7 - Drawn/Distressed Fill**

## 4.8 Lining

### Sub-digits

0-Any  
1-No Fit  
2-None  
3-Inline  
4-Outline  
5-**Engraved (Multiple Lines)**  
6-Shadow  
7-Relief  
8-Backdrop

**Figure 25****- Lining Types**



### Description

Lining refers to how the outlines of the characters are handled. **None** is just a simple line. **Inline** is a line that is shaded on the inside. **Outline** is shaded on the outside. Often in the outline case, the letter is indicated as white space on the background pattern. **Engraved** is used to indicate that the outlines have been multiplied (not necessarily the same number of times on all edges). **Shadow** indicates there is an offset copy of the outline to one side simulating a shadow. **Relief** has this offset copy attached and perspective rules applied to make the letter look three dimensional. **Backdrop** is for letters that look to be floating above a background.

### Examples

**Figure 26 - Lining Examples**

Panose font example

**2 - None**

Panose font example

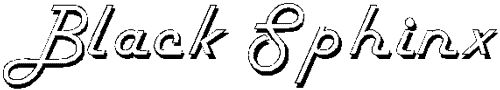
**3 - Inline**

Panose font example

**4 - Outline**

Panose font example

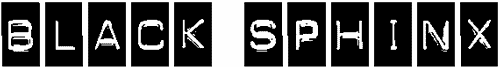
**5 - Engraved**



**6 - Shadow**

Panose font example

**7 - Relief**



**8 - Backdrop**

## 4.9 Topology

### Sub-digits

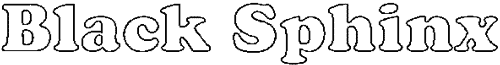
0-Any  
1-No Fit  
2-Standard  
3-Square  
4-Multiple Segment  
5-Deco (E,M,S) Waco midlines  
6-Uneven Weighting  
7-Diverse Arms  
8-Diverse Forms  
9-Lombardic Forms  
10-Upper Case in Lower Case  
11-Implied Topology  
12-Horseshoe E and A  
13-Cursive  
14-Blackletter  
15-Swash Variance

### Description

This digit attempts to encapsulate unusual characteristics inherent in the topology of the font. Sometimes faces have more than one of these characteristics and the classifier must make a judgment call. Remember that the reason for PANOSE numbers is to make distinctions, so choose what seems to best characterize the unique features of the font. **Standard** is for fonts that have normal looking character topologies. **Square** means that the font has an exaggerated square or angular character.**Multiple segments** reflect fonts where the strokes have been broken into multiple pieces. **Deco** refers to Art Deco style faces where the midlines are very high or low. Often characters like the E, M, and S have changed their forms markedly in these faces. **Uneven Weighting** implies that different elements within the font have consistently different weights. For example vertical stems are consistently very heavy relative to horizontal stems. **Diverse Arms** mean that the arms on different characters are dissimilar.**Diverse Forms** means that characters that would be similar in a text face, such as the b, d, g, q, are dissimilar. **Lombardic** Forms have exaggerated, manipulated stems. **Upper Case in Lower Case** means that there are variant caps or small caps in the positions in the character map that would usually be occupied by lower case forms. **Implied Topology** means that there are pieces of the characters missing, such as ascending diagonals, which the reader’s eye must interpolate.**Horseshoe E and A** means that even the most angular letters, like the E and A, have been rounded. **Cursive** means that the letter forms follow cursive models. **Blackletter** means that the letter forms follow German fraktur models. **Swash Variance**means that there are multiple variant swash capitals.

### Examples

**Figure 27 - Topology**



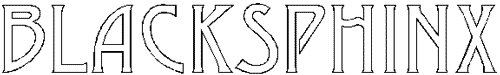
**2-Standard**



**3 - Square**

Panose font example

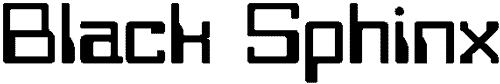
**4 - Multiple Segments**



**5 - Deco**



**6 - Uneven Weighting**



**7 - Diverse Arms**

Panose font example

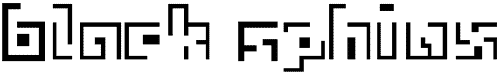
**8 - Diverse Forms**

Panose font example

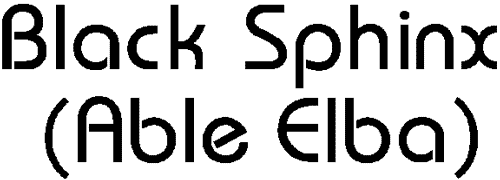
**9 - Lombardic**



**10 - Upper Case in Lower Case**



**11 - Implied Topology**



**12 - Horseshoe A and E**

Panose font example

**13 - Cursive**

Panose font example

**14 - Blackletter**

Panose font example

**15 - Swash Variance**

## 4.10 Range of Characters

### Sub-digits

0-Any  
1-No Fit  
2-Extended Collection  
3-Litterals  
4-No Lower Case  
5-Small Caps

### Description

This digit quantifies the range of characters available in the decorative font.**Extended Collection** means that the full font range is available. **Literals** means that only the alphanumerics are available. **No Lower Case** means just that. **Small Caps** means that only small caps are available in the font, no upper or lower case.

# 5.0 Latin Pictorial

## 5.1 Family Kind

### Sub-digits

0-Any  
1-No Fit  
2-Latin Text  
3-Latin Hand Written  
4-Latin Decorative  
**5-Latin Symbol**

### Description

Latin Symbol is where all the nonalphabetic fonts reside. These are fonts that can be loaded like normal text fonts, but do not contain readable characters. Dingbats and specialized symbol fonts are two examples.

## 5.2 Kind

### Sub-digits

0-Any  
1-No Fit  
2-Montages  
3-Pictures  
4-Shapes  
5-Scientific  
6-Music  
7-Expert  
8-Patterns  
9-Boarders  
10-Icons  
11-Logos  
12-Industry specific

### Description

**Montages** are symbol sets in which no single type of symbol is more that 50% of the total set.**Picture**sets are made up of pictures like hands, feet, religious symbols, hardware, flowers, buildings, clocks etc.**Shape** sets are made up of abstract shapes like arrows, boxes, squares, dots, stars, etc. **Scientific** sets contains specialized scientific symbols like math Greek letters, differential segments, etc. **Music** sets contain notes and specialized music symbols like clefs, sharps, flats, trills, etc. **Expert** sets are extensions to text fonts containing groups of specialized ligatures, groups of small caps, etc. **Pattern** sets contain line fill symbols, textures, etc. **Boarder** sets contain various kinds of simple or fancy boarder sections and corners. **Icon** sets contain block illustrations, symbolic shapes, etc. **Logo** sets contain copyrighted logos, registered artwork, etc. **Industry Specific** sets contain symbols specific to different fields, like medicine, law, engineering, etc.

**Montages** are the most common type of symbol set. The categories used to determine whether any one symbol type is dominant are the following:

Arrows  
Fraktur Characters  
Mathematical Set Operators  
Mathematical Symbol Parts (large integral, etc.)  
Other Mathematical Equation Operators  
Zodiac Symbols  
Card Suit Symbols  
Exaggerated Numbers  
Exaggerated Letters  
Exaggerated Punctuations  
Circled Characters  
Currency Symbols  
Special Ligatures  
Ornaments  
Border Art  
Boxes  
Xes  
Dots  
Stars  
Faces  
Hands  
Religious Symbols  
Miscellaneous

## 5.3 Weight

### Sub-digits

1-No Fit

### Description

The Weight digit is required by the PANOSE engine, but is not meaningful for symbol faces, so it is always set to 1.

## 5.4 Spacing

### Sub-digits

0-Any  
1-No fit  
2-Proportional Spaced  
3-Monospaced

### Description

This digit allows monospaced and proportional symbols to be distinguished.

## 5.5 Aspect ratio & contrast

### Sub-digits

1-No Fit

### Description

The Aspect Ratio & Composite digits is required by the PANOSE engine, but are not meaningful for symbol faces, so they are combined into this digit and always set to 1.

## 5.6 Aspect ratio of character 94

### Sub-digits

0-Any  
1-No Fit  
2-No Width  
3-Exceptionally Wide  
4-Super Wide  
5-Very Wide  
6-Wide  
7-Normal  
8-Narrow  
9-Very Narrow

### Description

The Aspect Ratio is taken to be the height of character 94 divided by the black width. Character 94 was chosen to be in the Lower ASCII range and thus usually used.

### Calculated Variable

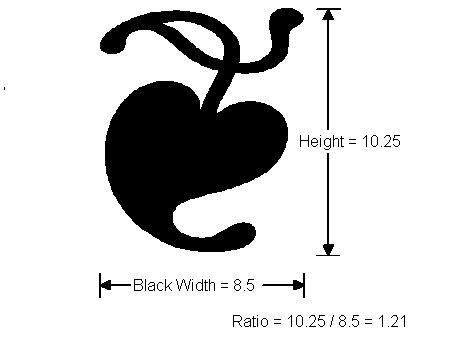
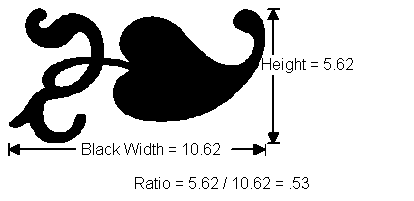
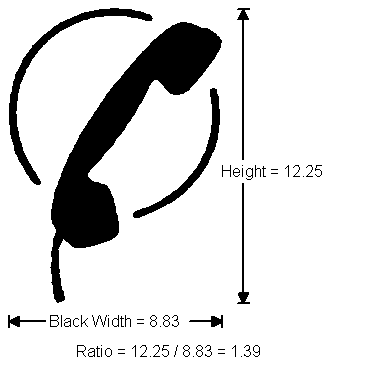
Ratio = Height / Black Width

### Classification

0-Any  
1-No Fit  
2-No Width..……………… there is no character 94  
3-Exceptionally Wide ……………0 Ratio  0.40  
4-Super Wide …………………0.40  Ratio 0.60  
5-Very Wide…………………. 0.60  Ratio 0.80  
6-Wide ………………………..0.80 Ratio 0.93  
7-Normal ……………………..0.93 Ratio 1.10  
8-Narrow …………………….1.10  Ratio 1.40  
9-Very Narrow ………………………Ratio 1.40

### Examples

**Figure 28 - Aspect Ratio Calculations**

## 5.7 Aspect ratio of character 119

### Sub-digits

0-Any  
1-No Fit  
2-No Width  
3-Exceptionally Wide  
4-Super Wide  
5-Very Wide  
6-Wide  
7-Normal  
8-Narrow  
9-Very Narrow

### Description

The Aspect Ratio is taken to be the height of character 119 divided by the black width. Character 119 was chosen to be in the Lower ASCII range and thus usually used.

### Calculated Variable

Ratio = Height / Black Width

### Classification

0-Any  
1-No Fit  
2-No Width..……………… there is no character 119  
3-Exceptionally Wide ……………0 Ratio  0.40  
4-Super Wide …………………0.40  Ratio 0.60  
5-Very Wide…………………. 0.60  Ratio 0.80  
6-Wide ………………………..0.80 Ratio 0.93  
7-Normal ……………………..0.93 Ratio 1.10  
8-Narrow …………………….1.10 Ratio 1.40  
9-Very Narrow ………………………Ratio 1.40

## 5.8 Aspect ratio of character 157

### Sub-digits

0-Any  
1-No Fit  
2-No Width  
3-Exceptionally Wide  
4-Super Wide  
5-Very Wide  
6-Wide  
7-Normal  
8-Narrow  
9-Very Narrow

### Description

The Aspect Ratio is taken to be the height of character 157 divided by the black width. Character 157 was chosen because it lies in the printer control area of the standard ASCII table and is thus often not used.

### Calculated Variable

Ratio = Height / Black Width

### Classification

0-Any  
1-No Fit  
2-No Width..……………… there is no character 157  
3-Exceptionally Wide ……………0 Ratio  0.40  
4-Super Wide …………………0.40  Ratio 0.60  
5-Very Wide…………………. 0.60  Ratio 0.80  
6-Wide ………………………..0.80 Ratio 0.93  
7-Normal ……………………..0.93 Ratio 1.10  
8-Narrow …………………….1.10  Ratio 1.40  
9-Very Narrow ………………………Ratio 1.40

## 5.9 Aspect ratio of character 163

### Sub-digits

0-Any  
1-No Fit  
2-No Width  
3-Exceptionally Wide  
4-Super Wide  
5-Very Wide  
6-Wide  
7-Normal  
8-Narrow  
9-Very Narrow

### Description

The Aspect Ratio is taken to be the height of character 163 divided by the black width. Character 163 was chosen to be in the Upper ASCII (8-bit ASCII) range and thus will likely be used only in an extended symbol set.

### Calculated Variable

Ratio = Height / Black Width

### Classification

0-Any  
1-No Fit  
2-No Width..……………… there is no character 163  
3-Exceptionally Wide ……………0 Ratio  0.40  
4-Super Wide …………………0.40  Ratio 0.60  
5-Very Wide…………………. 0.60  Ratio 0.80  
6-Wide ………………………..0.80 Ratio 0.93  
7-Normal ……………………..0.93 Ratio 1.10  
8-Narrow …………………….1.10  Ratio 1.40  
9-Very Narrow ………………………Ratio 1.40

## 5.10 Aspect ratio of character 211

### Sub-digits

0-Any  
1-No Fit  
2-No Width  
3-Exceptionally Wide  
4-Super Wide  
5-Very Wide  
6-Wide  
7-Normal  
8-Narrow  
9-Very Narrow

### Description

The Aspect Ratio is taken to be the height of character 211 divided by the black width. Character 211 was chosen to be in the Upper ASCII (8-bit ASCII) range and thus will likely be used only in an extended symbol set.

### Calculated Variable

Ratio = Height / Black Width

### Classification

0-Any  
1-No Fit  
2-No Width..……………… there is no character 211  
3-Exceptionally Wide ……………0 Ratio  0.40  
4-Super Wide …………………0.40  Ratio 0.60  
5-Very Wide…………………. 0.60  Ratio 0.80  
6-Wide ………………………..0.80 Ratio 0.93  
7-Normal ……………………..0.93 Ratio 1.10  
8-Narrow …………………….1.10  Ratio 1.40  
9-Very Narrow ………………………Ratio 1.40

# 6.0 Summary of Variables

AAcTall  
The height of the ARing character, “Å” ([Figure 14](http://monotype.de/services/pan2/#Fig14ARing)) is used to evaluate diacritical treatment. This is a vertical measurement and is taken from the baseline to the upper extent of the uppercase A portion of the ARing glyph. This measurement does not include the size of the ring. In the cases where the ring is joined to the uppercase A portion of the character, the measurement should be taken from the baseline to the lower extent of the inner white-space of the ring. The AAcTall measurement is used to determine X-height.

ACap  
The ACap ([Figure 10](http://monotype.de/services/pan2/#Fig10AMeasures)) variable measures the amount of flatness at the apex of the uppercase A. Most often, this is a simple horizontal measurement taken at the upper extent of the letterform. In more sophisticated designs, it may be necessary to take this measurement at an angle along a theoretical edge for the upper apex. It is common to have a font design that contains no flatness at the apex of the uppercase A glyph, or where the apex is highly rounded. In these cases, zero flatness is assigned. The ACap measurement is used to determine Midline.

ArmAHi ArmALo  
The thickness of the left diagonal stem of the uppercase A is described by the ArmAHi and ArmALo ([Figure 10](http://monotype.de/services/pan2/#Fig10AMeasures)) variables. These measurements are taken by projecting the theoretical stem edges of the left stem out to the baseline and capline of the letter. The ArmAHi measurement is then determined by measuring the thickness of the stroke at the capline. Similarly, the ArmALo is measured at the baseline. Both measurements are taken perpendicular to a line that depicts the middle of the stem. The ArmAHi and ArmALo measurements are used to determine Arm Style.

ArmCurv  
The curvature of the diagonal arms is captured by the ArmCurv ([Figure 10](http://monotype.de/services/pan2/#Fig10AMeasures)) variable. This measurement is taken at the mid point of an imaginary line which is drawn from the point where the left theoretical edge of the uppercase A intersects the baseline and capline. This line will often be coincident with the edge of the stem; the cases when this is not true need to be measured. The measurement is taken from the mid point of the imaginary line to the actual left edge of the stem. In the case of a concave stem this will result in a negative number, in the case of a bowed stem this will result in a positive number. The ArmCurv measurement is used to determine Arm Style.

ASerL ASerR  
This variable is a point-count variable similar to the CutCount field specified in the Arm Style digit. In this case the corners, rounded or square, of the left and right sides of the apex of the uppercase A are counted. A count of 1 is always entered for the single corner at the apex. The ASerL and ASerR ([Figure 10](http://monotype.de/services/pan2/#Fig10AMeasures)) measurements are used to determine Midline.

CapH  
CapH([Figure 2](http://monotype.de/services/pan2/" \l "Fig2UpperH)) is the cap height and it is measured on the uppercase H, from the top-most Y-extent to the bottom-most Y-extent along the theoretical midline of the left vertical stroke. The midline is chosen to avoid serifs that extend the height or depth of the character shape. This is a vertical measurement regardless of whether the character is italic or oblique. The CapH measurement is used to determine Serif Style, Weight, Proportion, Arm Style, and Midline.

CapPitch  
Many uppercase A glyph designs allow the right arm to project through the left arm at the apex of the letterform. Subsequently, that projected stem is then cut back to lessen its visual prominence. The angle at which the stem is cut back is recorded in the CapPitch ([Figure 10](http://monotype.de/services/pan2/#Fig10AMeasures)) variable, which is determined by measuring the angle of the theoretical tip of the uppercase A. This measurement will generally be between 0 and 90 degrees, and should be taken on any design where the upper extent of the right diagonal arm creates a surface that is not a rounding point for the apex. The CapPitch measurement is used to determine Midline.

CentDist  
The CentDist variable is needed to classify those designs that place the visual center of the fully round letterforms off true center. This measurement is taken by measuring the vertical distance from the baseline to the point at which the edge of the glyph reaches the right-most extent of the letterform. The line that defines the right-most extent must be skewed to match the character slant for this measurement. The CentDist measurement is used to determine Letterform.

CutCountHi CutCountLo  
The two CutCount ([Figure 11](http://monotype.de/services/pan2/#Fig11CutCount)) variables depict the number of corners at both terminations of the uppercase C. This measurement is only applied to serif letter forms and indicates the amount of serif detailing at the ends of the stroke. The procedure for this variable is loosely defined so as not to impede the simple goal of this attribute. Each surface of the detail at the termination of the C that is not a part of the major curve of the glyph is determined. From these surfaces the corners are counted and those counts determine the values for the CutCount variables. This process is completed for both the upper and lower termination of the uppercase C. The CutCountHi and CutCountLo measurements are used to determine Arm Style.

CutPitch  
The angle of termination on an uppercase C for a sans serif glyph is stored as the CutPitch ([Figure 12](http://monotype.de/services/pan2/#Fig12CutPitch)). This measurement is not taken on serif letterforms. The angle produced by the two points that terminate the upper stroke of the uppercase C is used to describe this variable. The left-most of the two points is used as the fulcrum of the angle. In the case of a highly rounded corner style at the termination of the stroke, the theoretical edge of the stroke must be determined and its angle recorded. The treatment of the lower termination of the stroke is not factored into this attribute. The CutPitch measurement is used to determine Arm Style.

Drop  
Drop([Figure 3](http://monotype.de/services/pan2/" \l "Fig3SerifMeasurments)) is the most difficult serif measurement to determine. It applies to serif designs and cannot be measured on a serif whose HipRad value is equal to the SerWidL value. Drop assumes that there is a straight line between the left edge of the serif tip and the lowest extent of the HipRad. Drop measures the vertical distance from the top of the serif tip to the point tangent to the bottom of the cove curve. As with the other serif detail measurements, this measurement is taken on the uppercase I. The Drop measurement is used to determine Serif Style.

EOut  
The EOut([Figure 5](http://monotype.de/services/pan2/#Fig5UpperE)) measurement is taken horizontally from the left-most X-extent of the theoretical backbone (i.e. excluding serif) to the right-most X-extent of the serif on the upper-most arm of the uppercase E. The EOut measurement is used to determine Serif Style.

EWid  
EWid([Figure 5](http://monotype.de/services/pan2/" \l "Fig5UpperE)) is a horizontal measurement that indicates the general width of the uppercase E, and is based on the point that the serif on the glyph loses tangency with the character height. This measurement is taken at the cap height line from the left-most extent of the theoretical stem edge on the uppercase E, discounting the serif, to the right-most extent of the serif. For fonts whose uppercase E stem is bowed or curved, the x-position of the left edge of the stem is placed average to the right and left extremes of the stem discounting the protrusions of serifs. The right extent of the upper arm of the uppercase E is taken from the closest vertical point on the tip of the arm to the cap height line. The EWid measurement is used to determine Serif Style and Proportion.

FootPitch  
The FootPitch ([Figure 10](http://monotype.de/services/pan2/#Fig10AMeasures)) measurement records the angle at which the stem on a sans serif uppercase A is terminated. Most often the measurement will be zero indicating that the bottom of the stem is parallel to the baseline. In some cases however, the stem is terminated perpendicular to itself, resulting in a measurement less than 170 degrees. The FootPitch measurement is used to determine Serif Style.

FootWid  
This measurement is used to compare the overall width of the foot of a stem with the width measurement of the stem. The FootWid ([Figure 3](http://monotype.de/services/pan2/#Fig3SerifMeasurments)) is a horizontal measurement taken at the baseline from the left-most extent to the right-most extent of the lower serif on the uppercase I. The FootWid measurement is used to determine Serif Style.

HipRad  
The HipRad([Figure 3](http://monotype.de/services/pan2/" \l "Fig3SerifMeasurments)) measurement describes the horizontal radius of the oval often formed when the serif connects to the stem. This measurement is taken on the uppercase I glyph. The HipRad is the distance from the theoretical left edge of the stem on the lower left serif to either the left edge of the serif or the point where the curve becomes tangent with a line extending to the left edge of the serif. The HipRad measurement is used to determine Serif Style.

HWid  
The HWid([Figure 2](http://monotype.de/services/pan2/" \l "Fig2UpperH)) is measured on the uppercase H, from the left theoretical stem edge of the left stem to the right theoretical stem edge of the right stem. It is taken along an imaginary line coincident with the average horizontal location of the character’s horizontal crossbar. The HWid measurement is used to determine Proportion.

InMid  
This measurement is similar to the OutMid measurement, except the Inter-edge line is drawn from the upper and right-most extents of the inner ellipse of the uppercase O.

It is a common measurement error to use the wrong Inter-edge line when both the InMid([Figure 7](http://monotype.de/services/pan2/" \l "Fig7UpperO)) and the OutMid are measured on the same sample. Always verify that the correct Inter-edge line is being used for the correct variable measurement. The InMid measurement is used to determine Stroke Variation.

InRad  
InRad([Figure 7](http://monotype.de/services/pan2/" \l "Fig7UpperO)) is the inside radius of the uppercase O. This horizontal measurement is taken on the same line used for OutRad, but the measurement is taken from the center of the glyph to the inside edge of the right stroke of the character. The InRad measurement is used to determine Stroke Variation.

JWid  
The width of the uppercase J ([Figure 9](http://monotype.de/services/pan2/#Fig9JWid)) is a horizontal measurement from the right theoretical edge of the stem to the left-most extent of the bowl or tail of the glyph, including any serif extensions on the left side. Again, in this case, since the two points may not fall on the same horizontal plane, the measurements must be skewed for non-upright glyphs. The JWid measurement is used to determine Proportion.

LTipRad  
LTipRad is similar to UTipRad ([Figure 3](http://monotype.de/services/pan2/#Fig3SerifMeasurments)), but this measurement reflects the lower left hand corner of the serif tip. Again, this is a vertical measurement taken on the uppercase I character. The LTipRad measurement is used to determine Serif Style.

MidA  
Like the MidE, MidA([Figure 10](http://monotype.de/services/pan2/" \l "Fig10AMeasures)) represents the distance from the center of the horizontal arm of the uppercase A to the baseline. To accommodate for extravagant letterforms, this measurement is taken at the horizontal midpoint of the glyph. Again, this is a vertical measurement and is not altered for italic characters. The MidA measurement is used to determine Midline.

MidE  
The MidE([Figure 5](http://monotype.de/services/pan2/" \l "Fig5UpperE)) variable specifies the distance of the center of the middle stem of the uppercase E from the baseline. This measurement is strictly vertical and is not changed for non-upright letterforms. If necessary, the measurement is also taken from the midpoint on the stem to avoid curvature or stem slanting that may be incorporated into the fonts design. The MidE measurement is used to determine Midline.

MidH  
The MidH ([Figure 2](http://monotype.de/services/pan2/#Fig2UpperH)) may be used in place of MidE if MidE is out of character with the face.

MWid  
Due to various topological changes used in the uppercase M character, the M Width ([Figure 8](http://monotype.de/services/pan2/#Fig8UpperM)) measurement is taken differently from the EWid([Figure 5](http://monotype.de/services/pan2/" \l "Fig5UpperE)), HWid([Figure 2](http://monotype.de/services/pan2/#Fig2UpperH)), and SWid([Figure 6](http://monotype.de/services/pan2/#Fig6UpperS)) measurements. The horizontal width of the uppercase M glyph is measured at the exact mid-height of the glyph from the left-most edge of the stroke on the left stem to the right-most edge of the stroke on the right stem. No approximations of theoretical edges are used for this measurement, nor are any alterations required for non-upright glyphs. The MWid measurement is used to determine Proportion.

NarO  
Similar to WideO, this variable is assigned by measuring the narrowest point of the uppercase O glyph, usually the top most extent of the letter-form and, in this case, measured vertically. The NarO([Figure 7](http://monotype.de/services/pan2/" \l "Fig7UpperO)) measurement is used to determine Contrast.

OTall  
OTall([Figure 7](http://monotype.de/services/pan2/" \l "Fig7UpperO)) depicts the height of the uppercase O glyph. It is a vertical measurement from the outside edge of the stroke at the top-most extent to the outside edge of the stroke at the bottom-most extent of the glyph. Skewed, italic, or oblique characters should not skew this measurement. It should remain strictly vertical. The OTall measurement is used to determine Proportion and Letterform.

OutMid  
There are several steps involved in determining the OutMid([Figure 7](http://monotype.de/services/pan2/" \l "Fig7UpperO)) measurement. The upper right corner of the uppercase O is used to determine the OutMid. The OutMid is a horizontal measurement that extends from the middle of the character to the character edge. Unlike the OutRad, the vertical placement of this measurement is not at the mid point of the glyph, but rather at a point specified by the intersection of a diagonal bisecting line referred to as the Inter-edge line.

The Inter-edge line is drawn from the glyph center to the intersection of two lines, one horizontal and one vertical, that indicate the vertical location of the upper extent of the character and the horizontal location of the right-most extent of the character. On a perfect circle, the resulting Inter-edge line is at a 45º angle.

With the Inter-edge line correctly drawn, the OutMid can be determined. It is a horizontal measurement taken from the horizontal mid point of the glyph to the point where the Inter-edge line intersects the outer edge of the glyph shape.

In non-upright characters, all vertical lines for measuring distances are skewed to match the oblique angle.

These two variables, OutRad and OutMid, are used to determine the curvature of the outer ellipse of the uppercase O glyph. These same measurements will be used later in the Letterform category to assign an overall character roundness value to a given font. To determine the speed of stoke transition, the curvature of the inner ellipse of the uppercase O must also be determined. The same process described above is repeated for the inside of the uppercase O glyph with InRad and InMid. The OutMid measurement is used to determine Stroke Variation and Letterform.

OutRad  
OutRad([Figure 7](http://monotype.de/services/pan2/" \l "Fig7UpperO)), or the outer radius, is a horizontal measurement taken on the uppercase O, from the center of the glyph to the right-most extent of the glyph shape. The OutRad measurement is used to determine Stroke Variation and Letterform.

OWid  
This horizontal measurement reflects the general width of the uppercase O glyph. It is measured from the left-most extent of the left side of the stroke, to the right-most extent of the right side of the stroke. Again, as with the SWid, if a skewed, italic, or oblique font is being classified, be certain to skew the left and right locations in order to obtain a true horizontal measurement. The OWid([Figure 7](http://monotype.de/services/pan2/" \l "Fig7UpperO)) measurement is used to determine Proportion.

SerOff  
SerOff([Figure 3](http://monotype.de/services/pan2/" \l "Fig3SerifMeasurments)) or the serif offset is the vertical distance measured along the theoretical mid-point of the vertical stem from the intersection of that line with the edge of the glyph to the lowest extent of the serif. SerOff is zero for glyphs that rest fully on the baseline. Is this measurement is taken on the uppercase I character. The SerOff measurement is used to determine Serif Style.

SerTall  
The height of the serif, or SerTall ([Figure 3](http://monotype.de/services/pan2/#Fig3SerifMeasurments)), is a vertical measurement taken on the lower left corner of the uppercase I, from the point that the serif departs from the vertical stem to the baseline. Note: The point of serif departure is obvious if printed samples are 300 dpi, but is less evident on high resolution output. The SerTall measurement is used to determine Serif Style.

SerTip  
The height of the serif tip, SerTip ([Figure 3](http://monotype.de/services/pan2/#Fig3SerifMeasurments)), is measured on the lower left-most extent of the uppercase I, from the highest extent to the lowest extent of the serif. Note: SerTip is measured to the bottom of the character, not the baseline. The SerTip measurement is used to determine Serif Style.

SerWidL  
The width of the lower left serif, or SerWidL ([Figure 3](http://monotype.de/services/pan2/#Fig3SerifMeasurments)), is a horizontal measurement taken from the left-most extent of the serif at the base of the uppercase I, to the left edge of the vertical stem at the point of serif departure. The SerWidL measurement is used to determine Serif Style.

SerWidR  
The width of the lower right serif or, SerWidR ([Figure 3](http://monotype.de/services/pan2/#Fig3SerifMeasurments)), is taken horizontally from the right side of the vertical stem at the point of serif departure to the right-most X-extent of the serif on the uppercase I. The SerWidR measurement is used to determine Serif Style.

Slant  
The slant([Figure 2](http://monotype.de/services/pan2/" \l "Fig2UpperH)) determines whether a typeface is normal and upright or oblique in design. The Uppercase H is used to measure the angle of the glyph and is taken between the outside angle of the theoretical edge of the left leg and the baseline. The Slant measurement is used to determine Letterform.

StemCor  
At times the corners of a sans serif glyph’s stems are rounded instead of sharp. The StemCor ([Figure 4](http://monotype.de/services/pan2/#Fig4StemCor))variable measures the horizontal radius of the lower left corner of the uppercase I. A fully rounded sans serif design would have a StemCor value equal to half the stem width. The StemCor measurement is used to determine Serif Style.

StressLo  
The StressLo variable is similar to the StressUp variable except that the measurements are taken on the lowercase o. The StressLo variable is used to determine Stroke Variation.

StressUp  
The angle of the stress of the rounded glyphs is characterized by locating the point at which the outer ellipse and inner ellipse of the uppercase O ([Figure 7](http://monotype.de/services/pan2/#Fig7UpperO)) are closest together and measuring that point’s angle to the center of the glyph. Intuitively picture the inner and outer ellipses as rails; the goal is to see where a ball that rolls between those rails fits the tightest.

Mathematically, the location can be found by locating the smallest value returned when measuring a line that is tangent to the outer ellipse to where that line crosses the inner ellipse. Once that point is determined a line is drawn from that point to the center of the glyph. The line formed is the StressUp value. The StressUp measurement is used to determine Stroke Variation.

SWid  
The uppercase S glyph is used to measure the SWid([Figure 6](http://monotype.de/services/pan2/" \l "Fig6UpperS)) variable. This horizontal measurement is taken from the left-most extent of the upper bowl to the right-most extent of the lower bowl. Because these two points will not fall on the same horizontal plane, skewing is required for italic glyphs. The skewing angle used for this measurement should be the same as that derived in the Letterform digit (the eighth PANOSE digit). If the font being classified is designed with oblique vertical stems, complete the Letterform classification prior to measuring the SWid. The SWid measurement is used to determine Proportion.

UTipRad  
The upper section of the serif tip radius, UTipRad ([Figure 3](http://monotype.de/services/pan2/#Fig3SerifMeasurments)), is measured on the lower left serif of the uppercase I. This measurement defines the radius of the largest possible circle drawn within the upper portion of the serif tip while retaining the maximum points of tangency. This measurement will usually exist in glyphs with cove or exaggerated serifs. Square serifs, thin line serifs, and triangle serifs will often have zero UTipRad. The UTipRad measurement is used to determine Serif Style.

WideO  
This variable is assigned by measuring the stem of the uppercase O glyph where it is thickest. Often this will be at the right or left-most extent of the letter-form, measured in a horizontal line. The WideO([Figure 7](http://monotype.de/services/pan2/" \l "Fig7UpperO)) measurement is used to determine Contrast.

WStem  
The width of the vertical stem, WStem([Figure 5](http://monotype.de/services/pan2/" \l "Fig5UpperE)), is measured horizontally at the x-height of the uppercase E. The E stem weight is taken at a point half way between the upper two arms. This measurement is the width of the vertical stem, or back bone, of the character. This measurement is to be taken perpendicular to the stem. In the case of an oblique letter, the horizontal axis is shifted to be perpendicular to the stem. The WStem measurement is used to determine Serif Style, Weight, and Midline.

XTall  
XTall([Figure 13](http://monotype.de/services/pan2/" \l "Fig13LowerX)) is the measurement of the lowercase characters from the baseline vertically to the upper extent of the upper left stem of the lowercase x. The XTall measurement is used to determine X-height.

# 7.0 Calculated Variables

AArm = MidA / CapH Midline  
ArmDif = EArm - AArm Midline  
ASer = (ASerL + ASerR) / 2 Midline  
CalcEm = CapH \* 1.5 Proportion  
CentProp = CentDist / OTall Letterform  
ConRat = NarO / WideO Contrast  
CurvRat = ArmCurv / CapH Arm Style  
CutRat = CutCountLo / CutCountHi Arm Style  
CuspRat = SerOff / WStem Serif Style  
DropRat = Drop / (SerWidL-HipRad) Serif Style  
DuckRat = AAcTall / CapH X-height  
EArm = MidE / CapH Midline  
FlatRat = TipSum / SerTip Serif Style  
FootRat = FootWid / WStem Serif Style  
HipRat = SerWidL-UTipRad / HipRad Serif Style  
InCurv = InMid / InRad Stroke Variation  
JMRat = JWid / MWid Proportion  
ORat = OTall / OWid Proportion  
OutCurv = OutMid / OutRad Stroke Variation,  
Letterform  
PropRat = WideRat / ThinRat Proportion  
RonRat = StemCor / WStem Serif Style  
SerOb = EWid / EOut Serif Style  
SerProp = SerTall / CapH Serif Style  
SerRat = SerTip / SerWidL Serif Style  
SerSize = SerWidL / CapH Serif Style  
Speed = OutCurv / InCurv Stroke Variation  
StepRat = SerTip / SerTall Serif Style  
SymRat = SerWidL / SerWidR Serif Style  
TaperRat = ArmAHi / ArmALo Arm Style  
ThinAv = (EWid + SWid) / 2 Proportion  
ThinRat = CalcEm / ThinAv Proportion  
TipRat = SerTip / WStem Serif Style  
TipSum = UTipRad + LTipRad Serif Style  
TRadAv = (UTipRad + LTipRad) / 2 Serif Style  
TrimRat = ACap / WStem Midline  
WeightRat = CapH / WStem Weight  
WideAv = (OWid + HWid) / 2 Proportion  
WideRat = CalcEm / WideAv Proportion  
XRat = XTall / CapH X-height

# 8.0 PANOSE Submission form

Source :

Font Name :

PANOSE number :

**Attach a copy of the PANOSE Classification sheet shown in**[**section 9**](http://monotype.de/services/pan6#Sec9PANOSEClassificationSheet)**.**

# 9.0 Sample PANOSE Classification sheet

Source : Hewlett - Packard Company. Contact : Karl Leuthold

Font name: Teras Sans Book Size:120 pt Date: 02/14/97 11:23 AM

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